兰州大学物理科学与技术学院 2024年报

ANNUAL REPORT

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兰州大学物理科学与技术学院官网

VR云逛院史馆

2024

Annual 年报 Report

勤学 | 悟道 | 创新 | 育才

兰州大学 物理科学与技术学院
School of Physical Science and Technology, Lanzhou University

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01

基本情况
BASIC INFORMATION

兰州大学物理科学与技术学院始源于1946年国立兰州大学所设物理系，是国务院学位委员会首批批准具有学士、硕士、博士学位授予权和首批设立博士后科研流动站的单位之一。

学院具有物理学一级学科博士点和博士后科研流动站，电子科学与技术一级学科硕士点，集成电路工程专业学位授权领域。具有物理学（包含理论物理，磁学，电子器件与材料工程，金属材料物理学）、微电子科学与工程2个全日制本科专业。具有国家自然科学基金委员会理论物理专款兰州理论物理中心、自旋多场耦合物理与器件学科创新引智基地、量子理论及应用基础教育部重点实验室、特殊功能材料与结构设计教育部重点实验室（校内共建）、甘肃省量子物理基础学科研究中心、甘肃省理论物理重点实验室、甘肃省功率半导体及光电器件工程实验室、甘肃省半导体器件行业技术中心以及国家“211工程”“985工程”“双一流”建设等经费支持的物理测试平台，入选第二批“中国物理学会科普教育基地”，具有物理学国家级实验教学示范中心、物理学基础学科拔尖学生培养计划2.0基地、国家基础科学研究与教学人才培养物理学基地等人才培养平台。物理学先后入选甘肃省重点学科、甘肃省一流学科建设名单，第四轮学科评估为B+，ESI排名前1%；物理学本科专业先后入选国家高等学校特色专业建设点和国家”一流专业“建设点。微电子科学与工程本科专业入选国家“一流专业”建设点。

学院目前在岗教职工170余人，其中教学科研人员130余人。教师中有：国家级教学名师1人，“国家高层次人才特殊支持计划”领军人才1人，国务院学位委员会学科评议组成员1人，首席科学家2人，教育部“长江学者奖励计划”特聘教授2人，国家有关人才项目专家1人，国家自然科学基金杰出青年基金获得者3人，百千万人才工程国家级人选1人，科技部“中青年科技创新领军人才” 2人，“国家高层次人才特殊支持计划”青年拔尖人才5人，“长江学者奖励计划”青年学者1人，国家自然科学基金优秀青年基金获得者3人，“国家高层次人才特殊支持计划”海外青年项目1人，新世纪优秀人才支持计划（含跨世纪）入选者8人，中国青年科技奖获得者1人，霍英东高校青年教师奖获得者2人，宝钢教育基金优秀教师奖获得者8人，中国政府友谊奖1人，甘肃省拔尖领军人才3人，甘肃省领军人才14人，甘肃省飞天学者3人，甘肃省教学名师1人，甘肃省青年科技奖2人，全国百篇优秀博士论文奖获得者和提名奖各1人，博士后创新人才支持计划2人。

学院围绕国家战略需求，瞄准科学前沿开展基础研究，积极推动科技成果转化。年均发表SCI论文200余篇；在*Nature Physics*、*Nature Communication*、*Physical Review Letters*、*Advanced Material*等顶级期刊发表论文近60篇。自2012年以来，承担包括国家重大科学研究计划项目在内的各类研究项目200余项。积极推动政产学研协同创新，与企业共建兰州大学-奥迪威传感器联合研究院、兰州大学-希磁科技共建实验室、兰州大学-业展电子电磁元器件联合实验室，积极承担横向课题，为地方经济服务。学院先后获得国家自然科学奖4项，国家科技进步奖1项，教育部科技进步奖11项，省部级科技进步奖36项。

学院秉承“勤学、悟道、创新、育才”的院训，培养了一大批基础扎实、踏实肯干的优秀人才，许多人成为著名的专家学者、企业家和优秀的党政管理人才，如中国科学院院士葛墨林、夏克青，加拿大皇家科学院院士刘惠春，美国麻省理工学院教授胡青，贵州省人民政府原副省长何力，纳思达股份有限公司董事长汪东颖，隆基股份董事长钟宝申、总裁李振国，沈阳隆基电磁董事长张承臣，广东奥迪威传感科技有限公司董事长张曙光，熵基科技董事长車全宏等。

学院学术交流频繁，建立“悟道”“创新”“勤学”“育才”格致系列论坛，邀请国内外著名专家学者来校访问讲学，年均派10余名教师在国内外一流高校进修或合作研究，与英、美、德、日、俄、加、新加坡等国家的众多高等院校和学术团体或国内的高校和科研院所都建立了良好的合作关系，在师资队伍、人才培养、科学研究、实验室建设等方面建立了紧密联系，对提升学院的办学水平、扩大学院在国内外的影响产生积极作用。理论物理交流平台在国家基金委理论物理专款十年滚动支持下辐射西部，推动西部理论物理发展，并成功升级为兰州理论物理中心。学院与周边科研院所如近物所、航空航天总公司510所等建立长期的合作关系，交流频繁，共享实验室、图书资料、合作课题，互聘教师授课，合作培养学生，形成良性的互动互助协作关系，已逐步形成“多边合作、资源共享、共同受益”的局面。

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02

组织机构
ORGANIZATION

现任领导班子

书　记	院　长	副书记	副院长	专项主管
吴国军	刘　翔	刘　翔	李星波	高大强
		王　岩	王建波	
		李星波	刘玉孝	
			田永辉	

平台类型

省部级及以上
物理学国家级实验教学示范中心
兰州理论物理中心
自旋多场耦合物理与器件学科创新引智基地
量子理论及应用基础教育部重点实验室
特殊功能材料与结构设计教育部重点实验室（校内共建）
甘肃省理论物理重点实验室
甘肃省功率半导体及光电器件工程实验室
甘肃省半导体器件行业技术中心
甘肃省量子物理基础学科研究中心
校　级
兰州大学引力研究中心
兰州大学–奥迪威传感器联合研究院
兰州大学–希磁科技共建实验室
兰州大学–业展电子电磁元器件联合实验室

02 组织机构
ORGANIZATION

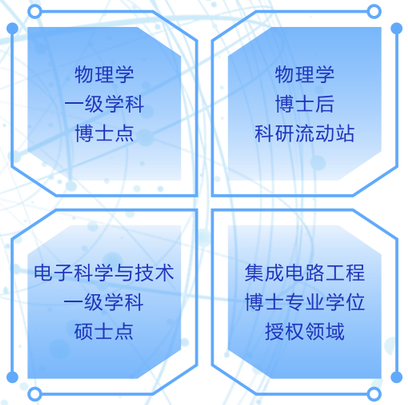
“三位一体”的组织架构

教研室	教工党支部	工会小组
基础物理Ⅰ教研室	基础物理Ⅰ教工党支部	基础物理Ⅰ工会小组
基础物理Ⅱ教研室	基础物理Ⅱ教工党支部	基础物理Ⅱ工会小组
物理学教研室	物理学教工党支部	物理学工会小组
微电子教研室	微电子教工党支部	微电子工会小组
大学物理教研室	大学物理教工党支部	大学物理工会小组
实验物理教研室	实验物理教工党支部	实验物理工会小组

党支部书记或支部委员兼任教研室主任、工会小组组长

03
学科建设
DISCIPLINARY CONSTRUCTION

03 学科建设 DISCIPLINARY CONSTRUCTION



学院具有物理学一级学科博士点和博士后科研流动站，电子科学与技术一级学科硕士点，集成电路工程博士专业学位授权领域。具有物理学、微电子科学与工程2个全日制本科专业。



- 入选甘肃省重点学科
  甘肃省一流学科建设名单
  第四轮学科评估结果为B+
- 入选甘肃省重点学科
- 入选国家高等学校特色专业建设点
  国家级“一流专业”建设点
- 入选国家级“一流专业”建设点

学科专业	人员/学生类别		一级学科/专业	学科/专业方向
	博士后		物理学	理论物理　凝聚态物理　微电子与器件物理　粒子物理与原子核物理
	研究生	博士	物理学	理论物理　凝聚态物理　微电子与器件物理　粒子物理与原子核物理
			电子信息（专业学位）	集成电路工程
		硕士	物理学	理论物理　凝聚态物理　光学　粒子物理与原子核物理　计算物理
			电子科学与技术	微电子学与固体电子学　物理电子学　电磁场与微波技术
			电子信息（专业学位）	集成电路工程
	本科		物理学	理论物理　磁学　电子器件与材料工程　金属材料物理学
			微电子科学与工程	

- 《固体物理学》《数学物理方法》入选教育部推进基础学科系列“101计划”物理学核心教材（全国共28本）





- 《热力学·统计物理》《量子力学》《量子场论》《数学物理方法》获评“十四五”普通高等教育省级规划教材
- 与新加坡国立大学苏州研究院签署“3+1+1”联合培养协议，与中国科学院物理研究所联合开展科教融汇协同育人项目，共同培养高质量拔尖创新人才
- 微电子科学与工程专业入选甘肃省创新创业教育示范专业和甘肃省高水平“新工科”建设专业
- 电子科学与技术一级学科硕士点通过学校学位授权自主审核成效评估专家现场评估和国务院学位委员会专项合格评估

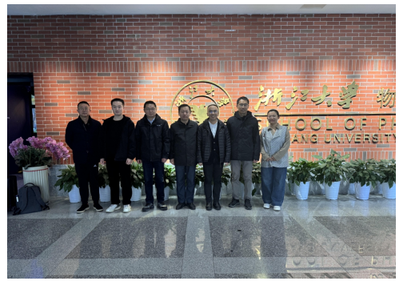


物理学一级学科博士点通过国务院学位委员会专家现场评估（等级优秀）

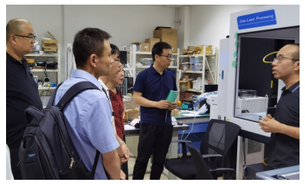
赴山东大学开展学科建设调研，赴浙江大学、南京大学、四川大学、厦门大学、极海微电子股份有限公司等开展人才培养调研。













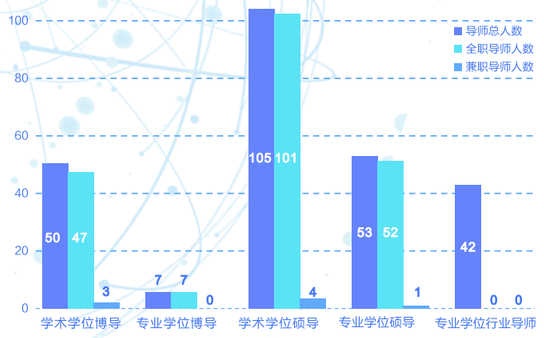




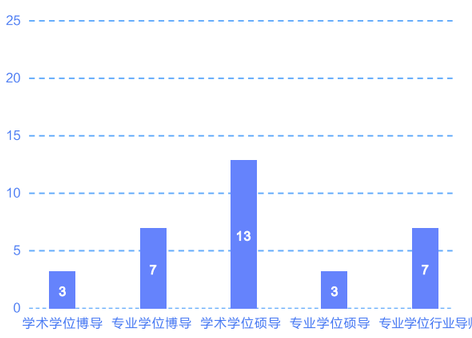


学术学位博导50人，其中兼职导师3人；专业学位博导7人；学术学位硕导105人，其中兼职导师4人；专业学位硕导53人，其中兼职导师1人；专业学位行业导师42人。新增学术学位博导3名、专业学位博导7名，学术学位硕导13名、专业学位硕导3名，专业学位行业导师7名。

学院研究生导师人数



新增研究生导师人数

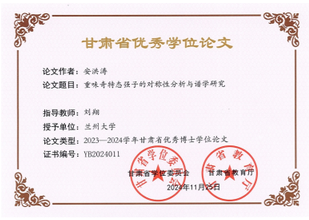




2023-2024学年甘肃省优秀学位论文入选名单

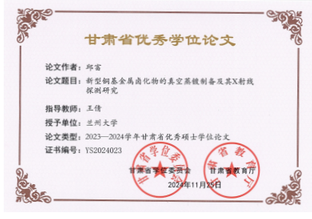
《重味奇特态强子的对称性分析与谱学研究》等5篇学位论文入选甘肃省优秀学位论文

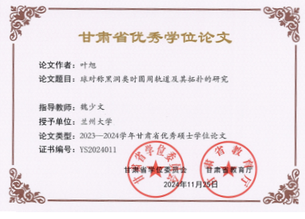
序号	论文题目	学科	作者姓名	导师姓名	类型
1	重味奇特态强子的对称性分析与谱学研究	物理学	安洪涛	刘翔	优博
2	基于无金属钙钛矿的X射线探测器研究	物理学	李枝仔	靳志文	优博
3	谱学支撑下的重味强子弱衰变过程的研究	物理学	李玉帅	刘翔	优博
4	新型铜基金属卤化物的真空蒸镀制备及其X射线探测研究	电子科学与技术	邱富	王倩	优硕
5	球对称黑洞类时圆周轨道及其拓扑的研究	物理学	叶旭	魏少文	优硕


甘肃省优秀学位论文
论文作者：安洪涛
论文题目：重味奇特态强子的对称性分析与谱学研究
指导教师：刘翔
授予单位：兰州大学
论文类型：2023—2024学年甘肃省优秀博士学位论文
证书编号：YB2024011
甘肃省学位委员会 甘肃省教育厅 2024年11月25日


甘肃省优秀学位论文
论文作者：李枝仔
论文题目：基于无金属钙钛矿的X射线探测器研究
指导教师：靳志文
授予单位：兰州大学
论文类型：2023—2024学年甘肃省优秀博士学位论文
证书编号：YB2024005
甘肃省学位委员会 甘肃省教育厅 2024年11月25日


甘肃省优秀学位论文
论文作者：李玉帅
论文题目：谱学支撑下的重味强子弱衰变过程的研究
指导教师：刘翔
授予单位：兰州大学
论文类型：2023—2024学年甘肃省优秀博士学位论文
证书编号：YB2024001
甘肃省学位委员会 甘肃省教育厅 2024年11月25日


甘肃省优秀学位论文
论文作者：邱富
论文题目：新型铜基金属卤化物的真空蒸镀制备及其X射线探测研究
指导教师：王倩
授予单位：兰州大学
论文类型：2023—2024学年甘肃省优秀硕士学位论文
证书编号：YS2024023
甘肃省学位委员会 甘肃省教育厅 2024年11月25日


甘肃省优秀学位论文
论文作者：叶旭
论文题目：球对称黑洞类时圆周轨道及其拓扑的研究
指导教师：魏少文
授予单位：兰州大学
论文类型：2023—2024学年甘肃省优秀硕士学位论文
证书编号：YS2024011
甘肃省学位委员会 甘肃省教育厅 2024年11月25日

2023-2024学年兰州大学优秀学位论文入选名单

《重味奇特态强子的对称性分析与谱学研究》等7篇学位论文入选兰州大学优秀学位论文

序号	论文题目	学科	作者姓名	导师姓名	类型
1	重味奇特态强子的对称性分析与谱学研究	物理学	安洪涛	刘翔	优博
2	基于无金属钙钛矿的X射线探测器研究	物理学	李枝仔	靳志文	优博
3	谱学支撑下的重味强子弱衰变过程的研究	物理学	李玉帅	刘翔	优博
4	新型铜基金属卤化物的真空蒸镀制备及其X射线探测研究	电子科学与技术	邱富	王倩	优硕
5	球对称黑洞类时圆周轨道及其拓扑的研究	物理学	叶旭	魏少文	优硕
6	$CuCo_2S_4$ 电极材料在铵离子超级电容器中的储能机制研究	物理学	吴青峰	张振兴	优硕
7	面向高并行大阵列光互连的接收机电路设计	电子科学与技术	熊永亮	李颖弢	优硕


兰州大学优秀学位论文

安洪涛：

您的博士学位论文《重味奇特态强子的对称性分析与谱学研究》被评为兰州大学 2023 – 2024 学年度优秀博士学位论文。

特发此证

兰州大学

2024年7月26日


兰州大学优秀学位论文

李枝仔：

您的博士学位论文《基于无金属钙钛矿的 X 射线探测器研究》被评为兰州大学 2023 – 2024 学年度优秀博士学位论文。

特发此证

兰州大学

2024年7月26日


兰州大学优秀学位论文

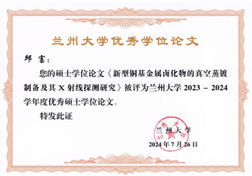
李玉帅：

您的博士学位论文《谱学支撑下的重味强子弱衰变过程的研究》被评为兰州大学 2023 – 2024 学年度优秀博士学位论文。

特发此证

兰州大学

2024年7月26日


兰州大学优秀学位论文

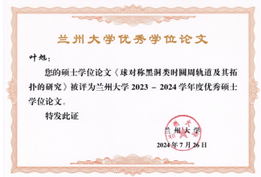
邱 富：

您的硕士学位论文《新型铜基金属卤化物的真空蒸镀制备及其 X 射线探测研究》被评为兰州大学 2023 – 2024 学年度优秀硕士学位论文。

特发此证

兰州大学

2024年7月26日


兰州大学优秀学位论文

叶 旭：

您的硕士学位论文《球对称黑洞类时圆周轨道及其拓扑的研究》被评为兰州大学 2023 – 2024 学年度优秀硕士学位论文。

特发此证

兰州大学

2024年7月26日


兰州大学优秀学位论文

吴青峰：

您的硕士学位论文《CuCo2S4 电极材料在铵离子超级电容器中的储能机制研究》被评为兰州大学 2023 – 2024 学年度优秀硕士学位论文。

特发此证

兰州大学

2024年7月26日


兰州大学优秀学位论文

熊永亮：

您的硕士学位论文《面向高并行大阵列光互连的接收机电路设计》被评为兰州大学 2023 – 2024 学年度优秀硕士学位论文。

特发此证

兰州大学

2024年7月26日

04 队伍建设
TEAM BUILDING

现有教职工 **170** 余人

其中教学科研人员 **130** 余人



教师中有：

国务院学位委员会学科评议组成员	1 人
首席科学家	2 人
“国家高层次人才特殊支持计划”科技创新领军人才	1 人
教育部“长江学者奖励计划”特聘教授	4 人
国家有关人才项目专家	1 人
国家青年科学基金（A类）	3 人
百千万人才工程国家级人选1人	1 人
科技部“中青年科技创新领军人才”	2 人
“国家高层次人才特殊支持计划”青年拔尖人才	5 人
国家级海外高层次人才引进计划（青年项目）	1 人
教育部“长江学者奖励计划”青年学者	1 人
国家青年科学基金（B类）	3 人
新世纪优秀人才支持计划（含跨世纪）入选者	8 人
中国青年科技奖获得者	1 人
霍英东高校青年教师奖获得者	2 人
宝钢教育基金优秀教师奖获得者	8 人
甘肃省拔尖领军人才	3 人
甘肃省领军人才	16 人
甘肃省飞天学者	3 人
甘肃省陇原青年英才	3 人
甘肃省陇原青年创新创业人才	1 人
甘肃省青年科技奖	2 人
全国百篇优秀博士论文奖获得者和提名奖各	1 人
博士后创新人才支持计划	2 人

● 人才引进与晋升

引进二级教授 1 人	刘小晰
引进青年研究员 5 人	罗肆强　陈　川　王振九　郭文帝　白思远
选聘十级实验师 1 人	赵晨博
博士后进站 13 人	卫文宣　蒋永恒　满自龙　钱日庆　张超岳　高　龙　崔腾龙 王　乔　刘　福　刘　畅　马金涛　宋亚磊　许有奎
晋升四级教授 1 人	关剑月
晋升七级副教授 1 人	王　涛

● 人才称号和获奖

教育部有关人才计划 1 人	柴国志
甘肃省领军人才第二层次 2 人	王雄飞　靳志文
甘肃省飞天学者特聘教授 1 人	田永辉
甘肃省重点人才项目 2 人	刘小晰　韩卫华
甘肃省陇原青年英才 1 人	张俊丽
第十一届甘肃青年科技奖 1 人	魏少文
甘肃省青年五四奖章 1 人	靳志文

● 人员变动

退休 2 人	肖春涛　胡显茹
博士后出站 5 人	罗肆强　张　宁　郭文帝　白思远　王忠宇

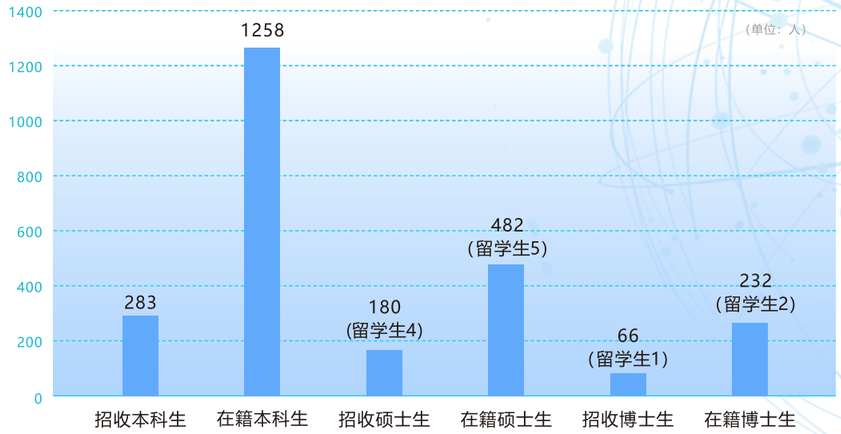
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05

教育教学
EDUCATION
AND TEACHING

2024年度招生情况

招收本科生283人，在籍本科生1258人；招收硕士生180人（留学生4人），在籍硕士生482人（留学生5人）；招收博士生66人（留学生1人），在籍博士生232人（留学生2人）。



开展本科教育教学审核评估迎评工作



本科教育教学审核评估校内自评



本科教育教学审核评估校外专家视察
（东北大学副校长徐峰）

微电子教研室

项目负责人：刘贵鹏

获评甘肃省优秀基层教学组织

微电子教研室由15位教师组成。承担了微电子科学与工程专业绝大部分的专业核心课程。负责微电子科学与工程专业的实验课程和实习实践。近年来获批省级教学团队1项，校级课程团队1项，省级教学类项目3项。《半导体器件物理》获批甘肃省一流本科线下课程。教研室成员指导学生参加专业类竞赛获得省级以上奖项100余项，国家级奖项30余项。



《基于能力导向的物理学本研贯通人才培养模式研究与实践》
（负责人：高大强）立项甘肃省高等教育教学成果培育项目

《高校教材的学科交叉与融合创新研究》（负责人：陶仁乾）
立项甘肃省教育厅2024年大中小学课程教材专项研究课题一般课题

《物理学拔尖学生全链条培养模式研究》（负责人：王建波）
基础学科拔尖学生培养计划研究课题甘肃省重点课题通过结题验收



白雪、卓仁富
获第四届全国高校电子信息类专业课程实验教学案例设计竞赛决赛
二等奖



关剑月、白雪
分获全国高等学校物理基础课程青年教师讲课比赛（甘肃赛区）
一等奖、二等奖



常鹏、王妍蓉
获西部高校课程思政建设联盟第一届课程思政案例大赛
二等奖



《微电子科学与工程专业实验》（负责人：李训栓）
获评兰州大学隆基教学创新奖
立项兰州大学教育教学改革研究项目重点项目（负责人：王心华）



《半导体材料》（负责人：赵桂娟）获批兰州大学“以研代学”类课程

《群论B》（负责人：王云华）获批兰州大学双语课程

《集成电路的计算机辅助设计（IC-CAD）》（负责人：刘贵鹏）获批兰州大学教学改革示范课程

立项兰州大学精品自编教材建设项目 4 项

《半导体器件物理》（负责人：杨建红）
《磁性测量》（负责人：王建波）
《量子物理基础》（负责人：安钧鸿）
《凝聚态理论讲义》（负责人：钟寅）

成立学院教师教学发展分中心和学生学业发展中心


兰州大学物理科学与技术学院文件

物理科学与技术学院关于成立教师教学发展分中心的通知


物理科学与技术学院教师教学发展分中心管理办法



开设“国际课程与实践周”课程 2 门

《引力波数据处理》《引力波天文学基础》



王建波、柴国志、刘占伟、田永辉、赵桂娟获兰州大学本科毕业论文优秀指导教师



曾竞等 **15** 名本科生参与本研贯通人才培养计划

2024年度本研贯通人才培养计划录取名单

序号	专业	姓名	导师姓名	培养层次
1	物理学（理论物理）	曾　竞	刘玉孝	本硕
2	物理学（理论物理）	刘子杨	刘玉孝	本硕
3	物理学（理论物理）	吴秋锐	刘占伟	本硕
4	物理学（电子器件与材料工程）	蒋之祺	俞连春	本硕
5	物理学（电子器件与材料工程）	邱烁成	张振兴	本硕
6	物理学（磁学）	蒋维天	曹江伟	本硕
7	物理学（磁学）	张　旭	柴国志	本硕
8	物理学（磁学）	李俊贤	蒋长军	本硕
9	物理学（磁学）	何佰川	田永辉	本硕
10	微电子科学与工程	谷　成	田永辉	本硕
11	微电子科学与工程	朱志琪	田永辉	本硕
12	微电子科学与工程	陈豪隆	王方聪	本硕
13	微电子科学与工程	王馨怡	王方聪	本硕
14	微电子科学与工程	袁雨蝶	王方聪	本硕
15	微电子科学与工程	谢颖慧	赵桂娟	本硕

白鑫阳等 **23** 名本科生参与强基计划转入研究生阶段

2024年度强基计划录取名单

序号	姓名	本科所在专业	报考导师	申请层次	转段专业	转段专业方向
1	蔡铭航	物理学（理论物理）	王雄飞	本硕	物理学	粒子物理与原子核物理
2	高晨曦	物理学（理论物理）	钟 寅	本硕	物理学	理论物理
3	白鑫阳	物理学（理论物理）	黄 亮	本硕	物理学	理论物理
4	董家骥	物理学（理论物理）	张玉鹏	本硕	物理学	理论物理
5	郝杰	物理学（理论物理）	安钧鸿	本硕	物理学	理论物理
6	姜国文	物理学（理论物理）	赵继泽	本硕	物理学	理论物理
7	刘毅阳	物理学（理论物理）	吴枝喜	本硕	物理学	理论物理
8	赵文慧	物理学（理论物理）	黄亮	本硕	物理学	理论物理
9	曹轩洋	物理学（磁学）	夏宝瑞	本硕	物理学	凝聚态物理
10	段宇	物理学（磁学）	夏宝瑞	本硕	物理学	凝聚态物理
11	范婷婷	物理学（磁学）	王建波	本硕	物理学	凝聚态物理
12	高腾	物理学（磁学）	范小龙	本硕	物理学	凝聚态物理
13	李嘉澍	物理学（磁学）	蒋长军	本硕	物理学	凝聚态物理
14	王曲文	物理学（磁学）	王建波	本硕	物理学	凝聚态物理
15	张津菁	物理学（磁学）	范小龙	本硕	物理学	凝聚态物理
16	张子阳	物理学（磁学）	柴国志	本硕	物理学	凝聚态物理
17	甄梓喆	物理学（磁学）	李志伟	本硕	物理学	凝聚态物理
18	周钱阳	物理学（磁学）	高大强	本硕	物理学	凝聚态物理
19	曾桂花	物理学(电子器件与材料工程)	谢二庆	本硕	物理学	凝聚态物理
20	何天浩	物理学(电子器件与材料工程)	韩卫华	本硕	物理学	凝聚态物理
21	朱昕怡	物理学(电子器件与材料工程)	兰 伟	本硕	物理学	凝聚态物理
22	任海宇	物理学(电子器件与材料工程)	靳志文	本硕	电子科学与技术	微电子学与固体电子学
23	张光彬	物理学(电子器件与材料工程)	田永辉	本硕	电子科学与技术	微电子学与固体电子学

陈子青等 **4** 名研究生入选国家公派留学项目

2024年度国家建设高水平大学公派研究生项目入选名单

序号	姓名	在学期间专业	导师	留学专业	留学单位	留学国别	入选项目类别
1	陈子青	物理学	魏少文	理论物理	滑铁卢大学	加拿大	联合培养博士
2	叶旭	物理学	魏少文	物理学	格罗宁根大学	荷兰	攻读博士学位
3	王鑫格	物理学	张振兴	电子科学与技术	格罗宁根大学	荷兰	攻读博士学位
4	王梦婷	物理学	刘玉孝	物理学	滑铁卢大学	加拿大	攻读博士学位

董雨奇等 **2** 人获批国家自然科学基金青年学生基础研究项目

2024年度获批国家自然科学基金青年学生基础研究项目

序号	项目类别	项目负责人	导师	项目名称
1	国家自然科学基金青年学生基础研究项目	董雨奇	刘玉孝	修改引力与引力磁效应的引力波极化模式研究
2	国家自然科学基金青年学生基础研究项目	冯晓玉	范小龙	RuO2外延薄膜中奈尔矢里的调控机理研究

濮晓凤等 **4** 人获批甘肃省优秀博士生项目

2024年获批国家级、省部级博士生项目名单

序号	项目类别	项目负责人	导师	项目名称
1	甘肃省优秀博士生项目	濮晓凤	高大强	用于低噪声正交磁通门传感器的复合结构磁芯设计
2	甘肃省优秀博士生项目	肖保全	丁莉芸	基于MXene@rGO的胆管癌光纤生物传感器制备与传感机理研究
3	甘肃省优秀博士生项目	李峰峰	兰 伟	MoS2异质结界面反应机制调控及可降解锋离子电池研究
4	甘肃省优秀博士生项目	苏美霞	张振兴	磁场促进稀土基高熵合金电催化剂的高效水分解反应的设计与研究

杨森等 11 人次赴国（境）外参加学术会议并做报告

2024年度研究生出国（境）参加国际学术会议并做报告名单

序号	姓名	培养层次	专业	导师	会议名称	会议地点	报告时间	报告题目	报告类型
1	杨森	博士	物理学	刘玉孝	第七届天琴空间科学任务国际研讨会	中国香港	2024.04.24-2024.04.27	Axial gravitational quasinormal modes of a self-dual black hole	口头报告
2	张景旭	博士	物理学	王雄飞	International Workshop on QCD theory and experiment, QCD@Work 2024	意大利特拉尼	2024.06.17-2024.06.22	Hyperon physics at BESIII	口头报告
3	邓琼	博士	物理学	黄亮	15th International LISA Symposium	爱尔兰	2024.07.06-2024.07.14	一种基于双星轨道运动与 GW 信号共振效应的 μ Hz GW 检测方法	论文张贴
4	董雨奇	博士	物理学	刘玉孝	50 Years of Horndeski Gravity: Exploring Modified Gravity	加拿大	2024.12.12		分组发言
5	董雨奇	博士	物理学	刘玉孝	COSMO‘24	日本	2024.10.20-2024.10.27	一般修改引力理论的引力波效应：以最一般矢量-张量理论为例	分组发言
6	杨赟彤	博士	物理学	罗洪刚	2024 国际磁学会议	意大利	2024.06.28-2024.07.07	通过自旋图案确认 Shastry-Sutherland 模型的基态相图	论文张贴
7	汉琳	博士	物理学	罗洪刚	粤港澳大湾区物理学会 2024 年联合年会	中国澳门	2024.07.29-2024.08.02	通过高次谐波产生对光梳进行相干控制的相位补偿设计	论文张贴
8	张小伟	硕士	集成电路工程	王方聪	IEEE International Symposium on Circuits and Systems	新加坡	2024.05.18-2024.05.24	一种带过温及过流保护功能的三相电机驱动器	论文张贴
9	滕厚强	博士	物理学	黄亮	15th International LISA Symposium	爱尔兰	2024.07.06-2024.07.14	高精度引力相关实验中自由分子流状态下有限开放系统的阻尼分离	分组发言
10	李通	博士	物理学	杨德政	18th International Conference on Electronic Materials 2024	中国香港	2024.05.16-2024.05.21	坡莫合金能量损耗的特征参数	分组发言
11	张超岳	博士	材料科学与工程	周金元	NanoGe	西班牙	2024.03.02-2024.03.11	场效应提升多硫化物转化能力的研究实现高性能的金属-硫电池	分组发言

杨赟彤等 3 人次赴国（境）外参加短期学术交流和科研合作

2024年度研究生赴国（境）外参加短期学术交流和科研合作名单

序号	姓名	培养层次	专业	导师	项目类型	项目名称	地点	交流时间
1	杨赟彤	博士	物理学	罗洪刚	暑期学校	量子连接 XIII：物理暑期学校（课程学习）	瑞典	2024.06.08-2024.06.23
2	杨赟彤	博士	物理学	罗洪刚	科研合作	埃尔朗根-纽伦堡大学应用物理系师生交流	德国	2024.06.23-2024.06.28
3	谭钧壬	硕士	材料科学与工程	谢二庆	寒暑期交流项目	新加坡南洋理工大 学 2024 暑期官方交流项目（罗客教育项目）	新加坡	2024.07.21-2024.08.01

招收SHOAIB AJMAL等来华留学生 5 人

2024年度来华留学生名单

序号	姓名	国籍	性别	学生类别	来华学习专业	经费来源	导师
1	SHOAIB AJMAL	巴基斯坦	男	博士研究生	物理学	中国政府奖学金	张振兴
2	FAISAL KHAN	巴基斯坦	男	硕士研究生	物理学	中国政府奖学金	王云华
3	ALI NOMAN	巴基斯坦	男	硕士研究生	物理学	中国政府奖学金	张振兴
4	KHAN JUNAID	巴基斯坦	男	硕士研究生	物理学	中国政府奖学金	张振兴
5	MUHAMMAD AWAIS RIAZ	巴基斯坦	男	硕士研究生	物理学	中国政府奖学金	韩卫华

签署联合培养协议 10 份

2024年度签署联合培养协议名单

序号	姓名	所在学校	联培单位	年级	培养层次	专业（方向）
1	韩胜男	兰州大学	大连理工大学物理学院	2022级	硕士研究生	理论物理
2	李悠宇	兰州大学	湖南大学物理与微电子科学学院	2023级	硕士研究生	理论物理
3	韩文辉	兰州大学	The Ecole Normale Sup é rieure de Lyon	2020级	博士研究生	理论物理
4	白宇杰	兰州大学	宁波工程学院微纳材料与器件创新研究院	2022级	博士研究生	微电子与器件物理
5	阳欣龙	兰州大学	中国科学院宁波材料技术与工程研究所	2023级	硕士研究生	凝聚态物理
6	刘紫楼	兰州大学	中国科学院北京纳米能源与系统研究所	2024级	硕士研究生	凝聚态物理
7	邹欣雨	兰州大学	中国航空工业集团公司北京长城计量测试技术研究所	2023级	硕士研究生	集成电路工程
8	赵皓宇	兰州大学	中国科学院数学与系统科学研究院	2023级	硕士研究生	集成电路工程
9	胡忠敏	中山大学	兰州大学物理学院	2022级	博士研究生	物理学
10	王博	中山大学	兰州大学物理学院	2024级	博士研究生	物理学

何东霖等 **9** 名研究生获2024年度甘肃省优秀研究生“创新之星”项目立项（含交叉专项1项）

2024年度获批研究生“创新之星”项目名单

序号	项目主持人	研究生层次	年级	指导教师姓名	项目名称	团队成员
1	何东霖	博士生	2022级	王涛	具有高 Snoek 极限和低损耗特性的18H六角铁氧体研究	刘露、谭梁睿
2	靳梦静	博士生	2022级	潘孝军	碱金属离子嵌入MoS_2作为高性能锂硫电池正极	李沐轩、宋剑桥、王瑞
3	彭天才	博士生	2022级	刘翔	强子的双部分子分布函数的研究	赖宝君
4	崔晓莎	博士生	2022级	张俊丽	锰氧化物电极-电解质界面电化学反应机制及动力学研究	王璟琦、王九洲、王盛渊、邓思达
5	刘卫宁	博士生	2023级	李海蓉	基于MOFs/MXene衍生复合异质结构高性能气敏传感器的研究	赵明阳、刘钊、丁琪
6	张恒彪	博士生	2024级	丁莉芸	基于光纤F-P腔的心脑血管压力传感器研究	张建涛、陈栋
7	李佳悦	硕士生	2023级	周金元	蒸汽选择刻蚀诱导的缺陷态MoS_2用于锂硫电池的研究	孙国文、张志龙
8	范雨知	硕士生	2024级	刘玉孝	修改引力理论中引力波的传播方程	董雨奇、赖小斌
9	许越隆	硕士生	2023级	刘贵鹏	基于FPGA的数字锁相环设计及应用研究	何易为、赵皓宇

出版《软磁金属高频磁性》教材（主编：薛德胜）



制定专硕试点工程类硕士培养方案：电子信息专业学位研究生培养方案

制定留学生培养方案：物理学学术学位研究生培养方案、电子信息专业学位研究生培养方案、电子科学与技术学术学位研究生培养方案

开展成长论坛 **4** 期


兰州大学物理科学与技术学院
School of Physical Science and Technology, Lanzhou University
成长论坛（第三期）
题 目：本科研究生期间的一点心得分享
李铁锃，物理科学与技术学院物理学专业博士研究生，2019年毕业于兰州大学物理学理论基地班，获理学学士学位。同年，以推免直博生身份进入兰州大学物理学院攻读物理学博士学位，研究生期间曾先后多次获评研究生国家奖学金、甘肃省三好学生及甘肃省优秀毕业生等荣誉，目前研究工作主要聚焦于新型存储机头金属钙钛矿材料的设计开发及器件应用，通过设计有机分子组分及构型设计，优化材料分子间作用力及结构因子，实现新型无毒环保型射线材料的稳定化应用，并扩展应用于柔性大面积的可穿戴X射线探测及成像系统。迄今为止，以第一作者身份在Adv. Mater.、Angew. Chem. Int. Ed.、Mater. Today、Adv. Funct. Mater.等国际高水平期刊上发表相关论文10篇。曾先后主持兰州大学中央高校基金（优秀研究生创新项目），甘肃省优秀研究生创新之星及兰州大学级研究生培育项目等多项关科研项目。
时 间：2024年4月11日（星期四）下午2:30
地 点：天山堂A203
兰州大学物理科学与技术学院
School of Physical Science and Technology, Lanzhou University
成长论坛（第四期）
题目：把读书当作一场修行——谈谈我的硕博六年及感悟
韩旭，2017年~2023年兰州大学物理学专业硕博连读，澳大利亚皇家墨尔本理工大学电子与通信工程专业联合培养博士生（双博士学位），在学期间，在回永辉教授指导下开展了硅基红薄膜锑酸锶集成光电子器件的系列研究，以第一作者发表SCI期刊论文10篇，成果多次当选期刊封面故事；授权发明专利6项；多次获邀参加国际知名国际学术会议作口头报告，获两次获得博士研究生国家奖学金；获Light: Science & Applications全国光学与光学工程博士生学术联赛西北赛区（陕甘青宁）一等奖（共两名），全国百强；获“兰州大学三好研究生”、“兰州大学优秀研究生”、“兰州大学2023届优秀毕业生”称号，目前以师资引进的方式加入合肥工业大学仪器科学与光电工程学院。
时 间：2024年5月23日（星期四）下午14:30
腾讯会议：254 844 526
兰州大学物理科学与技术学院
School of Physical Science and Technology, Lanzhou University
成长论坛（第五期）
题目：研读有你-助你上岸
刘文强，2020级理论物理专业硕士研究生，本科毕业于西北师范大学，本科期间成绩优异，荣获学生优秀奖、学院三好学生等荣誉称号。2023年，通过推免留学基金委（CSC）项目，赴英国曼彻斯特大学（UoM）开展联合培养，师从量点纳米光电领域、进一步拓宽了学术视野和研究深度。目前已在国内外学术期刊Physical Review E、Physical Review B、European Physical Journal Special Topics和Chinese Physics B上发表学术论文5篇，多次参加国际/国内重要学术会议，并荣获国家励志奖学金，获得了广泛关注。
题目：一“研”为定——24考研经验分享
本科毕业于陕西大学，现2024级研究生入学初试中表现出色，初试总分471分，专业课142分，通过以国家线调剂录取至兰州大学物理学院，本人学术学物理学院，本人学术兰州大学物理学院，本人学术兰州大学物理学院，本人学术兰州大

组织理论物理平台开放日活动

兰州理论物理中心2024春季学期科学开放日合影留念

2024.04.13



兰州理论物理中心2024秋季学期科学开放日

2024.9.21



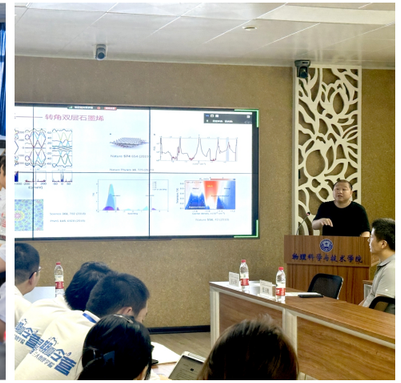
持续落实“三走近”计划，暑期共有 **38** 位本科生走近导师课题组开展科研学习

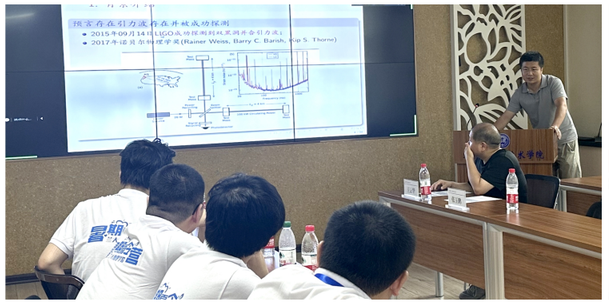
兰州大学物理学院2024年优秀大学生暑期夏令营

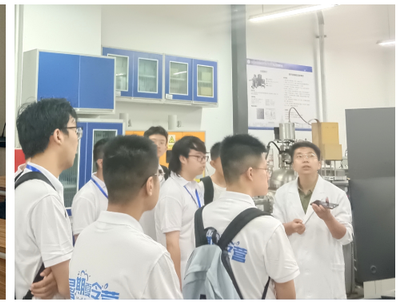
2024.7.20















张子涵等本科生发表学术论文 **5** 篇

2024年度本科生发表学术论文

指导教师	论文题目	期刊名称	期刊级别	作者
杨捷	Gravitational wave forms of galactic compact binaries with mass-transfer correction	PHYSICAL REVIEW D	SCI	张子涵

摘要： In this paper, we focus on the effect of mass-transfer between compact binaries like neutron star–neutron star systems and neutron star–white dwarf systems on gravitational waves (GWs). We adopt the mass quadrupole formula with 2.5 order post-Newtonian approximation to calculate the GW radiation and the orbital evolution. After a reasonable discussion of astrophysical processes concerning our scenario, two kinds of mass-transfer models are applied here. One is the mass overflow of the atmosphere, where the companion star orbits into the primary's Roche limit and its atmosphere overflows into the common envelope. The other one is the tidal disruption of the core, which is viewed as incompressible fluid towards the primary star, and in the near region branches into an accretion disk and direct accretion flow. Viewing this envelope and as a background, the GW of its spin can be calculated as a rotating nonspherically symmetric star. We eventually obtain the corrected gravitational waveform templates for different initial states in the inspiral phase.

李颖弢	Mechanical modeling and design optimization of heliostat based on particle swarm optimization algorithm	2024 International Conference on Computers, Information Processing and Advanced Education	EI	刘瑞泽

摘要： In this paper, the mechanism modeling and optimization design of heliostat field in tower photothermal power station are studied. The optical efficiency model of heliostat field is constructed by using geometric optics, coordinate transformation and multi-objective optimization methods. Firstly, the change of the sun's position is simulated, and the coordinate transformation equation is derived to calculate the shadow occlusion between the heliostat. Secondly, the calculation model of optical efficiency including mirror reflectivity, cosine loss, attenuation loss, shadow blocking and collector truncation efficiency is established. Finally, particle swarm optimization algorithm is used to optimize the mirror field arrangement to improve the overall optical efficiency. Through this research, it provides important theoretical basis and technical support for the design and operation of the tower photothermal power station.

指导教师	论文题目	期刊名称	期刊级别	作者
安钧鸿	Noise mitigation in quantum teleportation	PHYSICAL REVIEW A	SCI	许子健

摘要： Permitting the transmission of unknown quantum states over long distances by using entangle ment, quantum teleportation serves as an important building block for many quantum technologies. However, in the noisy intermediate-scale quantum era, the practical realization of quantum telepor tation is inevitably challenged by the noise-induced decoherence. We here propose a noise mitigation mechanism applicable in both the discrete- and continuous-variable quantum teleportation schemes. Via investigating the non-Markovian decoherence dynamics of the two types of quantum teleporta tion schemes, we find that, as long as a bound state is formed in the energy spectrum of the total system consisting of the involved subsystems and their respective reservoirs, the quantum superi ority of the fidelity is persistently recovered. Supplying an insightful understanding on the noise mitigation protocols, our result paves the way to the practical realization of noise-tolerant quantum teleportation.

蒋长军	Observation of the out-of-plane orbital antidamping-like torque	Royal Society of Chemistry	SCI	龚泽洋

摘要： The out-of-plane antidamping-like orbital torque fosters great hope for high-efficiency spintronic devices. Here we report experimentally the observation of out-of-plane antidamping-like torque that could be generated by z-polarized orbital current in ferromagnetic-metal/oxidized Cu（CuOx) bilayers, which is presented unambiguously by the magnetic field angle dependence of the spin-torque ferromagnetic resonance signal. The CuOx thickness dependence of the orbital torque ratios highlights that the interfacial effect would be responsible for the generation of orbital current. Besides that, the CuOx thickness dependence of the damping parameter further proves the observation of antidamping like torque. This result contributes to enriching the orbital-related theory of the generation mechanism of the orbital torque.

魏少文	The gravitational lensing by rotating black holes in loop quantum gravity	Nuclear Physics, Section B	SCI	董玉豪

摘要： In this paper, we explore gravitational lensing effects associated with rotating black holes within the framework of loop quantum gravity. Utilizing the Gauss-Bonnet theorem as extended by Ono et al., we compute the light deflection angle in the weak field limit for a lens that is finitely distanced from both the source and the observer. Our findings indicate that the weak deflection angle for rotating black holes in LQG is smaller than that observed for the classical Kerr black holes, albeit with minimal deviations. In the strong field limit, we determine the photon sphere radius, the light deflection angle, and lensing observables, including the image position θ_∞ , angular separation s, magnification r_{mag}, and temporal delays among various relativistic images. By considering supermassive black holes, such as Sgr A* and M87*, within the LQG framework, we calculate these observables and investigate the influence of the quantum parameter A_λ on them, compared with the Kerr black hole outcomes. Our comparative analysis reveals that the image position θ_∞ and separation s for Sgr A* consistently exceed those for M87*, whereas M87* exhibits considerably greater time delays than Sgr A*. These distinctions could be important in differentiating between rotating black holes in LQG and classical Kerr black holes in future astronomical observations.

2024年度本科生优秀毕业论文名单

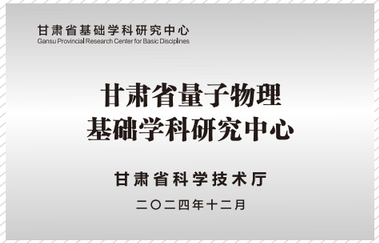
序号	论文题目	专业	作者	导师
1	混凝土有效振捣时长异地检测技术研究	微电子科学与工程	江煊明	王心华
2	基于量子高斯过程回归的永磁同步电机快速控制策略	微电子科学与工程	姚北林	王方聪
3	氧化锌/铌酸钾异质结光电化学型紫外探测器的制备及性能研究	微电子科学与工程	张江伟	常鹏
4	基于 RISC-V 指令集架构五级流水线 CPU 设计	微电子科学与工程	许森钱	王鹏
5	基于 FPGA 的 PID 算法	微电子科学与工程	周子励	刘贵鹏
6	高速电吸收调制器	微电子科学与工程	王星宇	王方聪
7	溶液法制备背接触式晶硅太阳电池性能研究	微电子科学与工程	崔立言	李颖弢
8	基于 NVDLA 开源框架的神经网络加速器的设计与实现	微电子科学与工程	马轩宇	王鹏
9	基于薄膜铌酸锂的可调谐微波光子滤波器研究	微电子科学与工程	王飞宇	田永辉
10	氧化铁基纳米复合材料的设计及气敏性质研究	微电子科学与工程	夏启伟	周金元
11	应变对单层二维材料 WSe2 中缺陷形成能的影响	微电子科学与工程	颜秉宇	赵桂娟
12	数字锁相环的设计与仿真	微电子科学与工程	屈添雨	刘贵鹏
13	薄膜铌酸锂中的布里渊效应仿真与设计	微电子科学与工程	冯子航	贾浩
14	可见光通信系统的模拟预均衡电路	微电子科学与工程	朱梦佳	贾浩
15	一种高速 MOSFET 栅极驱动器设计	微电子科学与工程	张文逸	李颖弢
16	一种高瞬态响应的低压差线性稳压器设计	微电子科学与工程	曹智涵	李颖弢
17	基于氧化锌/氧化锡异质结构的气体传感器的制备及性能研究	微电子科学与工程	舒琪	王妍蓉
18	多孔镍铁氧化物纳米材料的制备及气体传感器件研究	微电子科学与工程	刘奎琳	王妍蓉
19	基于 FPGA 的自定义 SPI 协议数据采集卡设计	微电子科学与工程	陈羿鹏	刘贵鹏
20	基于分段曲率补偿技术的低温漂带隙基准电路设计	微电子科学与工程	刘兆想	李颖弢
21	氧化钨基二氧化氮气敏传感器的研究	微电子科学与工程	颜家琦	王妍蓉
22	神经量子态及其在变分蒙特卡罗方法中的应用	物理学（理论物理）	宋昀泰	钟寅
23	内建极化电场对光催化薄膜内光生载流子传输的影响	物理学（电子器件与材料工程）	刘紫楼	韩卫华
24	二维半导体金属接触的层数依赖关系	物理学（电子器件与材料工程）	张若莉	王鹏
25	用于硅光收发芯片的高速 PCB 板设计	物理学（电子器件与材料工程）	王昱	赵桂娟
26	增加 MoS2 吸收层的 GaN 宽谱光电探测器	物理学（电子器件与材料工程）	吴海燕	赵桂娟
27	InGaAs/InP 雪崩光电二极管中结构对过剩噪声因子以及暗电流的影响	物理学（电子器件与材料工程）	林劲博	刘贵鹏
28	二维 CuInP2S6 铁电极化的非线性光学探测	物理学（电子器件与材料工程）	张欣然	赵桂娟
29	基于薄膜铌酸锂的模式开关器件设计	物理学（电子器件与材料工程）	宋晓喆	田永辉
30	Li 替代 MnZn 铁氧体的电磁性能	物理学（电子器件与材料工程）	周瑜亮	史慧刚
31	标量场引力塌缩问题的数值求解	物理学（电子器件与材料工程）	徐澄宇	刘玉孝
32	不同电位下电沉积 FeNi 薄膜磁性能的研究	物理学（电子器件与材料工程）	王琳川	史慧刚
33	用于高灵敏度光探测的准二维(AEP)BiI5 基探测器	物理学（电子器件与材料工程）	安宝毅	靳志文
34	激光拉曼光谱在锂离子电池研究中应用	物理学（电子器件与材料工程）	丁弘宇	苏庆
35	2D/3D 体异质结晶圆 X 射线探测器光电性能的研究	物理学（电子器件与材料工程）	杨万芳	王倩
36	混杂量子系统中的磁振子阻塞效应	物理学（电子器件与材料工程）	翟豪	刘占伟
37	FeMn 薄膜的制备与磁性研究	物理学（磁学）	杨喻安	王建波
38	磁性微丝环向交流磁滞回线测试方法研究	物理学（磁学）	俞周路	柴国志
39	磁性异质结构中电流诱导转矩的二次谐波测量研究	物理学（磁学）	闫邵政	曹江伟
40	铁磁金属/拓扑材料制备与自旋动力学	物理学（磁学）	郭永全	范小龙
41	磁性多层膜中的磁结构研究	物理学（磁学）	陈绩	魏晋武
42	免分割傅立叶叠层成像优化研究	物理学（磁学）	王治平	贾浩
43	Rastall-标量张量理论中引力波的极化模式	物理学（理论物理）	范雨知	刘玉孝
44	利用蒙特卡洛抽样组态间的关联研究相变	物理学（理论物理）	盛卓然	程晨
45	膜世界中的准正规模式	物理学（理论物理）	杨奇	刘玉孝
46	微波光子晶体介质柱误差分析	物理学（理论物理）	马海虓	黄亮
47	自旋-1/2 XXZ 海森堡链及其图案语言介绍	物理学（理论物理）	梁嘉伟	罗洪刚
48	粉末 X 射线衍射的指标化与理论分析	物理学（理论物理）	施展鹏	位建强
49	渗流相变中的极端事件统计	物理学（理论物理）	周天净	董家奇
50	FP 光学微腔光频梳量子噪声研究	物理学（理论物理）	李彬	贾成龙
51	银河系内致密双星系统引力波波形研究	物理学（理论物理）	张子涵	杨捷
52	纯规范场的格点模拟	物理学（理论物理）	彭哲源	刘占伟
53	方格子中 SU(4)自旋-轨道耦合模型的磁化研究	物理学（理论物理）	张雨	赵继泽
54	环境资源限制和强化学习对演化博弈的影响研究	物理学（理论物理）	陈奕多	关剑月
55	致密双星系统绕转阶段的后牛顿计算与偏心极化模板波形	物理学（理论物理）	杨扬	杨捷
56	远平衡一维 Floquet 系统拓扑、本征态序研究	物理学（理论物理）	张子轩	程晨
57	由 Lambda_c^+重子和 pi^-介子构成的类氢强子物质的研究	物理学（理论物理）	周豪	刘翔

年报 | 2024 Annual Report

06

科学研究
SCIENTIFIC RESEARCH

平台建设



甘肃省量子物理基础学科研究中心获批



成立兰州大学–业展电子电磁元器件联合实验室

关键指标

科研项目立项 **91** 项

入账经费 **4038.17** 万元

国家级重大重点项目

学院作为课题负责单位成功申请并获批2024年国家重点研发计划项目**3**项
学院承担经费**320**万元（蒋长军）、**650**万元（张安民）、**242.26**万元（安钧鸿）

国家自然科学基金项目

共获批国家自然科学基金**18**项，立项经费**934**万元
其中国际(地区)合作与交流项目（重点项目）**1**项，直接经费**251**万元（田永辉）
面上项目**8**项，青年科学基金项目**6**项，青年学生基础研究项目(博士研究生)**3**项

省部级项目

共获批省部级项目**17**项，立项经费**360**万元
其中甘肃省重点项目**1**项，甘肃省重点研发计划项目**3**项

横向项目

立项总数**48**项，其中超过**10**万元以上的横向项目**29**项，到账经费**1336**万元

顶尖成果

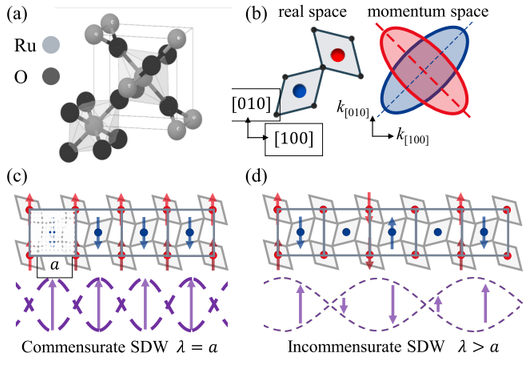
发表SCI论文225篇，其中10篇发表在学校认定的顶级期刊上：
3篇*Physical Review Letters*（范小龙、吴威、安钧鸿、薛德胜、高存绪）
2篇*Advanced Materials*（靳志文）
2篇*Nature Communications*（杨德政、席力）
3篇*Physical Review Letters*（安钧鸿、王雄飞、贾成龙、于东星），非第一单位

Incommensurate Spin Density Wave in Antiferromagnetic RuO_2 Evinced by Abnormal Spin Splitting Torque

Feng, Xiaoyu, Bai, Hua, Fan, Xinxin, Guo, Muhan, Zhang, Zhiqiang, Chai, Guozhi , Wang, Tao, Xue, Desheng, Song, Cheng, Fan, Xiaolong

Physical Review Letters

Since the discovery of antiferromagnetism, metallic oxide RuO_2 has exhibited numerous intriguing spintronics properties such as the anomalous Hall effect and anisotropic spin splitting effect. However, the microscopic origin of its antiferromagnetism remains unclear. By investigating the spin splitting torque in RuO_2/Py, we found that metallic RuO_2 exhibits a spatially periodic spin structure which interacts with the spin waves in Py through interfacial exchange coupling. The wavelength of such structure is evaluated within 14-20 nm depending on the temperature, which is evidence of an incommensurate spin density wave state in RuO_2. Our work not only provides a dynamics approach to characterize the antiferromagnetic ordering in RuO_2, but also offers fundamental insights into the spin current generation due to anisotropic spin splitting effect associated with spin density wave.





团队介绍

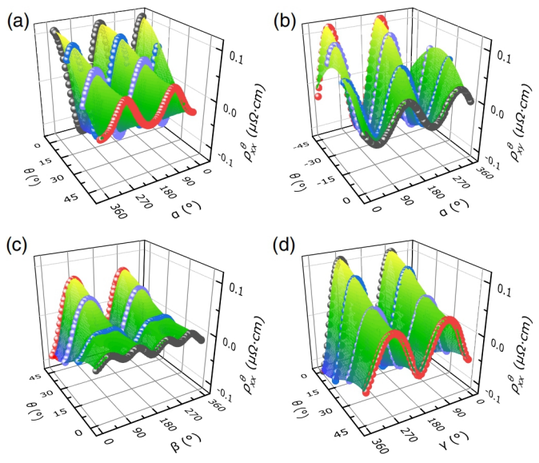
范小龙教授科研团队长期在自旋动力学与自旋电子学领域开展研究工作，近几年在 *Phys. Rev. Lett.* 、*Phys. Rev.* B等高水平期刊上发表论文多篇。团队以自旋角动量定向输运与自旋动力学之间的紧密联系为突破口，在自旋整流效应的物理本质与应用开发、针对微纳尺度自旋电子学器件与材料的局域化表征方法、自旋霍尔效应的定量表征与微观机理方面取得了成果。

Anisotropic Galvanomagnetic Effects in Single Cubic Crystals: A Theory and Its Verification

Miao Yu, Sun Junwen, Gao Cunxu, Xue Desheng, Wang X. R.

Physical Review Letters

A theory of anisotropic galvanomagnetic effects in single cubic crystals and its experimental verifications are presented for the current in the (001) plane. In contrast to the general belief that galvanomagnetic effects in single crystals are highly sensitive to many internal and external effects and have no universal features, the theory predicts universal angular dependencies of longitudinal and transverse resistivity and various characteristics when magnetization rotates in the (001) plane, the plane perpendicular to the current, and the plane containing the current and [001] direction. The universal angular dependencies are verified by experiments on $Fe_{30}Co_{70}$ single cubic crystal film. The findings provide new avenues for fundamental research and applications of galvanomagnetic effects, because single crystals offer advantages over polycrystalline materials for band structure and crystallographic orientation engineering.





团队介绍

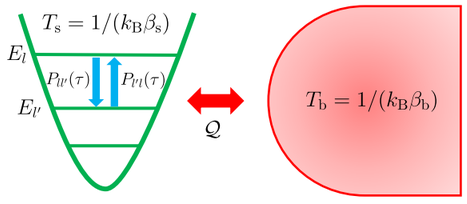
薛德胜教授科研团队由多位青年教师组成，围绕凝聚态物理领域晶格、电荷、自旋和轨道间相互作用所面临的共性科学问题开展研究。以晶体材料及其异质结器件为研究载体，深耕晶体力、热、光、电、磁、超导等基础物性，并理解晶体物性和器件工作的微观物理机制，明确材料和器件性能间的构效关系，基于电荷和自旋输运以及磁电互控开发新材料、发现新效应、研究新原理、提出新机制、设计新器件，同时提高电荷和自旋在输运时相互转化效率并降低电荷和自旋在输运以及磁电互控时的功率损耗，最终实现具有自主知识产权的更低功耗、更高速度和更高可靠性的电子器件。团队获批多项国家级、省级、校级科研项目，指导的学生多次荣获国家奖学金、甘肃省三好学生、甘肃省优秀毕业生等荣誉。

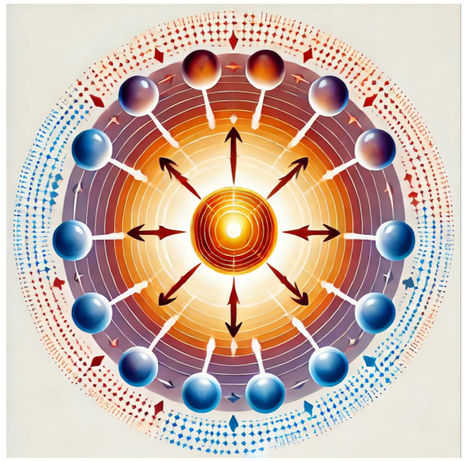
Generalized Quantum Fluctuation Theorem for Energy Exchange

Wu, Wei, An, Jun-Hong

Physical Review Letters

The nonequilibrium fluctuation relation is a cornerstone of quantum thermodynamics. It is widely believed that the system-bath heat exchange obeys the famous Jarzynski-W & oacute;jcik fluctuation theorem. However, this theorem is established in the Born-Markovian approximation under the weak-coupling condition. Via studying the energy exchange between a harmonic oscillator and its coupled bath in the nonMarkovian dynamics, we establish a generalized quantum fluctuation theorem for energy exchange being valid for arbitrary coupling strength. The Jarzynski-W & oacute; jcik fluctuation theorem is recovered in the weak-coupling limit. We also find the average energy exchange exhibits rich nonequilibrium characteristics when different numbers of system-bath bound states are formed, which suggests a useful way to control the quantum heat. Deepening our understanding of the fluctuation relation in quantum thermodynamics, our result lays the foundation to design high-efficiency quantum heat engines.







团队介绍

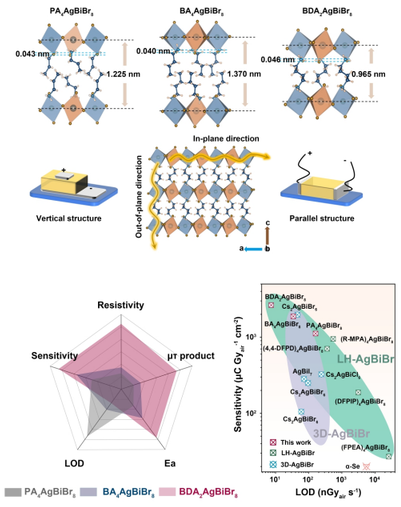
安钧鸿教授科研团队由2名教授、2名青年研究员、6名博士生、7名硕士生组成。团队主要从事量子物理基础问题研究，包括量子光学、量子精密测量、量子/拓扑相变以及量子热力学等方面的研究。近年来，团队成员主持科技部科技创新2030项目课题1项、军委科技委创新课题2项、国家自然科学基金面上项目5项、青年项目2项。在量子电池、量子精密测量与Floquet拓扑物态方面取得了突出的研究成果，在*Physical Review Letters*、*Physical Reyiew A/B/E/Research/Applied*等高水平学术期刊上发夷论文100余篇。团队成员入选国家万人计划青年拔尖人才、甘肃省领军人才、军委科技委国防科技创新特区主题专家、中科院青促会特邀会员、博士后创新人才支持计划等荣誉称号。

Molecular Design of Layered Hybrid Silver Bismuth Bromine Single Crystal for Ultra-Stable X-ray Detection with Record Sensitivity

Chen Huanyu, Li Zhenhua, Wang Shuo, Peng Guoqiang, Lan Wei, Wang Haoxu, Jin Zhiwen

Advanced Materials

Nowadays, weak interlayer coupling and unclear mechanism in layered hybrid silver bismuth bromine (LH-AgBiBr) are the main reasons for limiting its further enhanced X-ray detection sensitivity and stability. Herein, the design rules for LH-AgBiBr and its influence on X-ray detection performance are reported for the first time. Although shortening amine size can enhance interlayer coupling, its detection performance is severely hampered by its easier defect formation caused by enlarged micro strain. In contrast, an appropriate divalent amine design endows the material with improved interlayer coupling and released micro strain, which benefits crystal stability and mechanical hardness. Another contribution is to increase material density and dielectric constant; thus, enhancing X-ray absorption and carrier transport. Consequently, the optimized parallel device based on $BDA_2AgBiBr_8$ achieves a record sensitivity of 2638 μC Gy_{air}^{-1} cm^{-2} and an ultra-low detection limit of 7.4 $nGy_{air}s^{-1}$, outperforming other reported LH-AgBiBr X-ray detectors. Moreover, the unencapsulated device displays remarkable anti-moisture, anti-thermal (>150°C), and anti-radiation (>1000 Gy_{air}) endurance. Eventually, high-resolution hard X-ray imaging is demonstrated by linear detector arrays under a benign dose rate (1.63 $\mu Gy_{air}s^{-1}$) and low external bias (5 V). Hence, these findings provide guidelines for future materials design and device optimization.

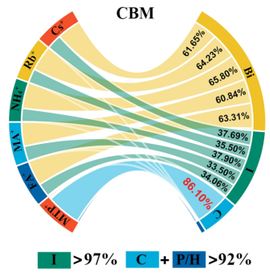


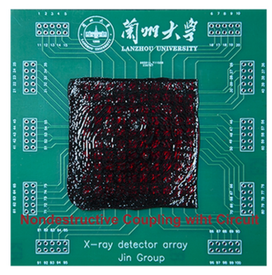
Tailoring Multi-Phenyl Ring Cation for Stable Scalable Hybrid Bismuth Iodide Amorphous Film: Enabling Record Sensitivity and High-Performance X-ray Array Imaging

Xu Youkui, Li ZhenHua, Shi Chang, Li Yumai, Lei Yutian, Peng Guoqiang, Yu Tengfei, Ren Haiyu, Wang Haoxu, Fan Hengzhong, Zhang Yongsheng, Ci Zhipeng, Wang Qian, Jin Zhiwen

Advanced Materials

The 329-type bismuth (Bi)-based metal halide (MH) polycrystalline films have potential to be applied in the new generation of X-ray imaging technology owing to high X-ray absorption coefficients and excellent detection properties. However, the mutually independent $[Bi_2X_9]^{3-}$ units and numerous grain boundaries in the material lead to low carrier transport and collection capabilities, severe ion migration, large dark currents, and poor response uniformity. Here, a new multi-phenyl ring methyltriphenylphosphonium (MTP) is designed to optimize the energy band structure. For the first time, the coupling between the A-site cation and $[Bi_2X_9]^{3-}$ is realized, making it the main contributor to the conduction band minimum (CBM), getting rid of dilemma that carrier transport is confined to $[Bi_2X_9]^{3-}$. Further, the preparation of $MTP_3Bi_2I_9$ amorphous large-area wafer is achieved by melt-quenching; the steric hindrance effect improves stability, increases ion migration energy, and promotes response uniformity (14%). Moreover, the amorphous structure takes advantage of A-site cation participation in the conductivity, achieving a record sensitivity (7601 μC Gy^{-1} cm^{-2}) and low dark current (approximate to 0.11 nA) in the field of amorphous X-ray detection, and features low-temperature large-area preparation. Ultimately, designing amorphous array imaging devices that exhibit excellent response uniformity and potential imaging capabilities is succeeded here.







团队介绍

靳志文科研团队由2名教授、1名青年研究员、1名副教授、2名博士后、8名博士生、12名硕士生组成。团队研究围绕X射线等高能射线（α、β、γ、中子、宇宙射线等）探测成像技术领域所面临的关键共性科研问题展开。以卤化物等新型半导体材料为研究载体，充分理解影响材料光电物理和器件工作的物理机制，明确材料与器件性能间的构效关系，开发AI模型与算法迭代设计新材料，并同时推进AI增强的计算光谱与计算成像研究与系统开发，最终实现具有自主知识产权的低剂量、高分辨、大面积的高能辐射探测与成像系统。团队学生多次获评国家奖学金、甘肃省三好学生、甘肃省优秀毕业生等荣誉，并获批多项省级、校级科研项目。

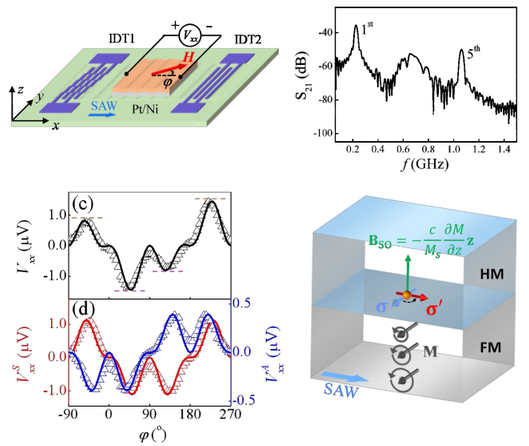
Acoustic spin rotation in heavy-metal-ferromagnet bilayers

Cao Yang, Ding Hao, Zuo Yalu, Li Xiling, Zhao Yibing, Li Tong, Lei Na, Cao Jiangwei, Si Mingsu, Xi Li, Jia Chenglong, Xue Desheng, Yang Dezheng

Nature Communications

Through pumping a spin current from ferromagnet into heavy metal (HM) via magnetization precession, parts of the injected spins are in-plane rotated by the lattice vibration, namely acoustic spin rotation (ASR), which manifests itself as an inverse spin Hall voltage in HM with an additional 90 degrees difference in angular dependency. When reversing the stacking order of bilayer with a counter-propagating spin current or using HMs with an opposite spin Hall angle, such ASR voltage shows the same sign, strongly suggesting that ASR changes the rotation direction due to interface spin-orbit interaction. With the drift-diffusion model of spin transport, we quantify the efficiency of ASR up to 30%. The finding of ASR endows the acoustic device with an ability to manipulate spin, and further reveals a new spin-orbit coupling between spin current and lattice vibration.

Controlling spin direction is the key for spintronic devices as it induces efficient and field-free switching. Herein, the authors propose using lattice vibrations in acoustic devices to replace the charge motion in conventional spintronic devices to realize the rotation of spin direction, that is, acoustic spin rotation. Acoustic spin rotation offers higher efficiency than spin rotation in conventional charge-current based spintronic devices.





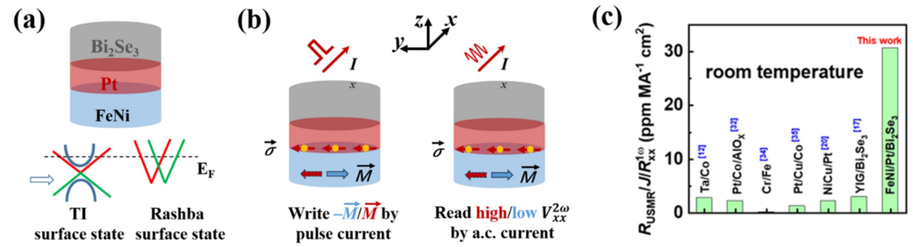
团队介绍

杨德政教授科研团队由1名教授、2名萃英博士后、3名博士生组成。团队一直开展基于自旋电子学和表面声学波的研究。以自旋电子学器件和表面声学波器件为研究载体，以电输运测试、THz测试、声学测试为手段，利用电荷、磁场、激光、晶格等多种方式调控电子自旋，充分理解电荷、磁场、激光、晶格和电子自旋的耦合机理，提高其调控自旋的效率，最终开发具有更低功耗、更高效率的自旋电子学器件及声自旋电子学器件。团队在*Nature Communications*、*Advanced Materials*、*Physical Review B*等杂志上发表论文60余篇，并获批多项省级、校级科研项目及博士后科学基金。

Large unidirectional spin Hall magnetoresistance in FeNi/Pt/Bi_2Se_3 trilayers by Pt interfacial engineering

Zhang Qi, Tao Kun, Jia Chenglong, Xu Guofu, Chai Guozhi, Zuo Yalu, Cui Baoshan, Yang Dezheng, Xue Desheng, Xi Li

Nature Communications



Unidirectional spin Hall magnetoresistance (USMR) has emerged as a promising candidate for magnetoresistive random-access memory (MRAM) technology. However, the realization of high signal-to-noise output signal in USMR devices has remained a challenge, primarily due to the limited USMR effect at room temperature. In this study, we report a large USMR effect in FeNi/Pt/Bi_2Se_3 trilayers through interfacial engineering with Pt to optimize the spin current transmission efficiency and electron-magnon scattering. Our devices exhibit a USMR value that is an order of magnitude higher than previously reported systems, reaching 30.6 ppm/MA/cm^2 at room temperature. First-principles calculations and experimental observations suggest that the Pt layer not only preserves the spin-momentum locked topological surface states in Bi_2Se_3 at the Fermi-level but also generates additional Rashba surface states within the Pt itself to enhance the effective SOT efficiency. Furthermore, we demonstrate that the two-terminal USMR-MRAM devices show robust output performance with 2nd harmonic resistance variation around 0.11 Ω/mA. Remarkably, the performance of these devices further improves at elevated temperatures, highlighting their potential for reliable operation in a wide range of environmental conditions. Our findings pave the way for future advancements in high-performance, energy-efficient spintronic memory devices.

Unidirectional spin Hall magnetoresistance refers to an asymmetric resistance response, which allows for the readout of the magnetic state from two terminal devices. Here, Zhang et al demonstrate a large unidirectional spin hall magnetoresistance FeNi/Pt/Bi_2Se_3 trilayers and present a robust random-access magnetoresistance device.



团队介绍

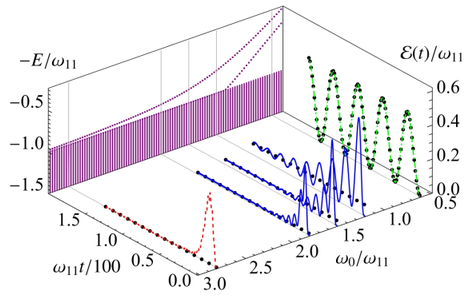
自旋量子材料与功能器件团队由刘小晰和席力两位教授、左亚路副教授、崔宝山青年研究员、5名博士生，10名硕士生组成。团队聚焦自旋电子学与量子材料的前沿研究，主要方向包括自旋轨道矩（SOT）器件、磁性斯格明子（Skyrmions）物理与器件、人工神经网络硬件实现、太赫兹自旋电子学、超导自旋电子学等方向的研究。团队依托多学科交叉优势，开展从理论计算、量子材料生长到功能器件制备的全链条研究，致力于开发新型低功耗自旋存储与计算器件。近年来在*Nat. Commun.*系列、*Adv. Mater.*等顶级期刊发表多项成果，承担国家自然科学基金、甘肃省重点人才团队等项目，并与国际知名机构保持合作，旨在为后摩尔时代信息技术提供量子调控与器件应用的创新解决方案。

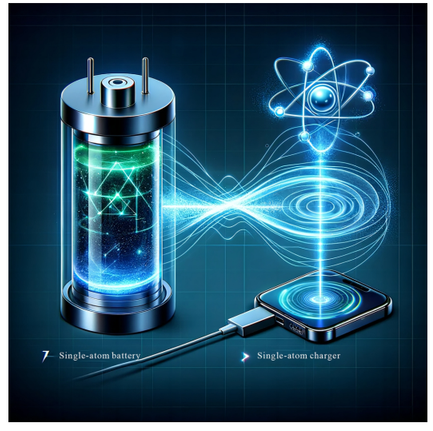
Remote Charging and Degradation Suppression for the Quantum Battery

Wan-Lu Song, Hai-Bin Liu, Bin Zhou, Wan-Li Yang, and Jun-Hong An

Physical Review Letters

The quantum battery (QB) makes use of quantum effects to store and supply energy, which may outperform its classical counterpart. However, there are two challenges in this field. One is that the environment-induced decoherence causes the energy loss and aging of the QB, the other is that the decreasing of the charger-QB coupling strength with increasing their distance makes the charging of the QB become inefficient. Here, we propose a QB scheme to realize a remote charging via coupling the QB and the charger to a rectangular hollow metal waveguide. It is found that an ideal charging is realized as long as two bound states are formed in the energy spectrum of the total system consisting of the QB, the charger, and the electromagnetic environment in the waveguide. Using the constructive role of the decoherence, our QB is immune to the aging. Additionally, without resorting to the direct charger-QB interaction, our scheme works in a way of long-range and wireless-like charging. Effectively overcoming the two challenges, our result supplies an insightful guideline to the practical realization of the QB by reservoir engineering.



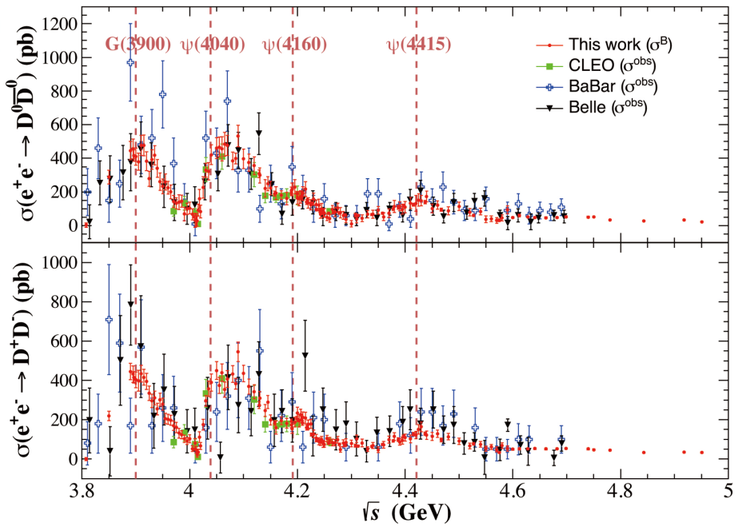


团队介绍见P43

Precise Measurement of Born Cross Sections for $e^+e^- \to D\overline{D}$ at $\sqrt{s} = 3.48 - 4.95$ GeV

M. Ablikim et al.* BESIII Collaboration

Physical Review Letters



Using data samples collected with the BESIII detector at the BEPCII collider at center-of-mass energies ranging from 3.80 to 4.95 GeV, corresponding to an integrated luminosity of 20 fb-1, a measurement of Born cross sections for the $e^+e^- \to D^0\overline{D}^0$ and D^+D^- processes is presented with unprecedented precision. Many clear peaks in the line shape of $e^+e^- \to D^0\overline{D}^0$ and D^+D^- around the mass range of $G(3900)$, $\psi(4040)$, $\psi(4160)$, $Y(4260)$, and $\psi(4415)$, etc., are foreseen. These results offer crucial experimental insights into the nature of hadron production in the open-charm region.



团队介绍

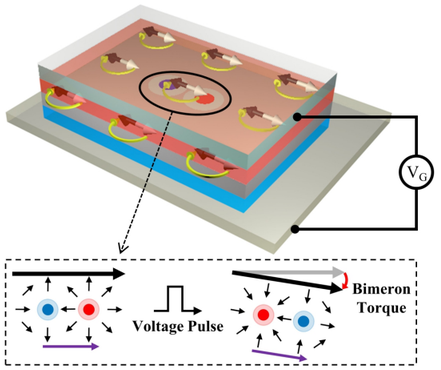
王雄飞教授科研团队现由 8 名博士生和 2 名硕士生构成。该团队的研究重点聚焦于高能物理实验，致力于开展北京谱仪III实验中重子对产生以及正反物质不对称性等方面的研究工作。目前，团队已在*Nature*、*Physical Review Letters*、*Journal of High Energy Physics*等顶级期刊学术刊物上发表了30余篇高能物理实验相关的学术论文。团队中的学生多次在国际大会上汇报研究进展，荣获最佳口头报告奖、海报奖，同时，多人获评国家奖学金、学业奖学金、研究生标兵等荣誉。

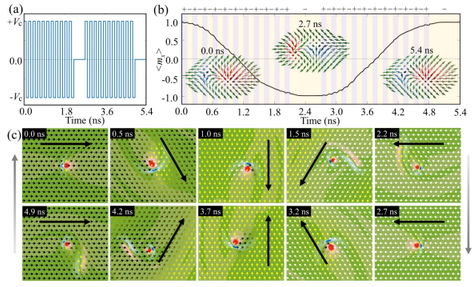
Voltage-Controlled Bimeron-Torques Switching of In-Plane Magnetization

Yu Dongxing, Ga Yonglong, Li Peng, Jiang Jiawei, Liang Jinghua, Wang Liming, Jia Chenglong, Chang Kai, Yang Hongxin

Physical Review Letters

Controlling the out-of-plane magnetization in nanodevices via electric currents has played a pivotal role in advancing high-impact data storage and nonvolatile logic technologies within spintronic devices. However, the in-plane magnetization materials, which are more accessible than their out-of-plane counterparts, are less favored in terms of switching efficiency and magnetization stability. This is due to their larger switching barriers, resulting in a higher critical switching current in the commonly used spin-transfer torques or spin-orbit torques magnetic random-access memory. Here, we propose the use of voltage-controlled bimeron-torques to switch in-plane magnetization for ultralow energy consumption magnetic random-access memory. In this mechanism, magnetic bimerons act as spin-angular-momentum carriers as well as momentum transfer media rather than that of electrical spin currents in spin-transfer torques or spin-orbit torques. We address the microscopic origin of this mechanism and demonstrate its validity with two examples: $Co(MoTe_2)_2$ and $HgInP_2O_6$ monolayers, respectively. The mechanism overcomes the restriction of perpendicular magnetization and avoids Joule heating, thereby providing additional pathways for electrical manipulation of magnetic materials.







团队介绍

贾成龙教授、于东星研究员科研团队由2名正高级职称人员、1名博士后、7名博士生、4名硕士生组成。团队主要从事量子磁性和关联电子系统方向的理论研究，重点致力于拓扑磁性多场调控机理的探索以及量子计算和新型自旋电子器件设计开发等研究。近年来团队在*Physical Review Letters*、*Nature Communications*、*National Science Review*等国际顶级学术期刊上发表过多篇论文，相关成果被中国科学杂志社，*Phy.org*等科技新闻媒体或网站转载报导，受到了国内外专家的广泛认可，多篇论文入选封面文章，ESI高被引文章和编辑推荐亮点工作。团队成员多次获批科技部、教育部和国家自然科学基金委面上、重点和重大项目。

文章列表

序号	所有作者	题目	期刊名（Source Title）	联系人
1	Xiao-Yu Zhang, Li Zhao, Yong-Qiang Wang	Dirac stars in Anti-de Sitter spacetime	The European Physical Journal C	赵力
摘要	In this paper, we construct the Dirac stars model composed of two Dirac fields and Einstein gravity in four-dimensional Anti-de Sitter spacetime. We consider the Dirac stars with free field (no self-interacting). Our investigation focuses on understanding the relationship between Arnowitt-Deser-Misner (ADM) mass and binding energy in relation to the cosmological constant. Furthermore, we extend the study to the Dirac stars with self-interacting potentials. For the self-interacting Dirac stars, three types of interactions are examined: only quartic, only sextic, quartic and sextic interactions that is kind of Q-ball type interactions. In these three distinct scenarios, it is essential to investigate the impact of self-interaction constants on Dirac stars. Additionally, we study the Dirac solitons in the AdS background. Finally, we discussed the dependence of the spectral flow of the Dirac Hamiltonian on the model parameters.			
2	Sun, Shi-Xian; Cui, Si-Yuan; Huang, Long-Xing; Fang, Tie-Feng; Wang, Yong-Qiang	κ-Dirac stars	The European Physical Journal C	王永强
摘要	In this paper, we construct a Dirac star model composed of |κ| pairs of spinor fields. The azimuthal harmonic indices m of these spinor fields are half-integers, and they satisfy -(|κ| - 1/2) ≤ m ≤ |κ| - 1/2. When κ = 1, it corresponds to the conventional Dirac star model, formed by two spinor fields with m = 1/2 and m = -1/2. When |κ| > 1, among these |κ| pairs of spinor fields, there exist spinor fields with azimuthal harmonic indices m > 1/2, and all spinor fields still conform to the same Dirac field equation. Different families of solutions are distinguished by the value of κ, so we named these solutions κ-Dirac stars. We obtain solutions for κ = ±1, ±2, ±3, ±4, ±5, ±6 by using numerical methods. Additionally, we compute their ADM mass M, Noether charge Q, and binding energy E, and illustrate how these quantities change with the spinor field's frequency ω for different κ. We observe significant differences between solutions for |κ| > 1 and the |κ| = 1 case. Furthermore, we provide the energy density distribution of the Dirac stars, wherein for |κ| > 1 scenarios, the Dirac stars exhibit a spherical shell-like structure. Moreover, we employ three-dimensional diagrams to intuitively depict how κ influences the combination of spinor fields to form a spherically symmetric configuration.			
3	Hao, Chen-Hao; Huang, Long-Xing; Su, Xin; Wang, Yong-Qiang	Emergence of negative mass in general relativity	The European Physical Journal C	王永强
摘要	We investigate a symmetric traversable wormhole model, integrating Einstein's gravitational coupling phantom field and a nonlinear electromagnetic field. This work indicates the emergence of negative ADM mass within a specific parameter range, coinciding with distinct alterations in the wormhole's spacetime properties. Despite violating the Null Energy Condition (NEC) and other energy conditions, the solution exhibits unique characteristics in certain energy-momentum tensor components, potentially accounting for the manifestation of negative mass.			
4	Chen, Zi-Qing；Wei, Shao-Wen	Thermodynamical topology with multiple defect curves for dyonic AdS black holes	The European Physical Journal C	魏少文
摘要	Dyonic black holes with quasitopological electromagnetism exhibit an intriguing phase diagram with two separated first-order coexistence curves. In this paper, we aim to uncover its influence on the black hole thermodynamical topology. At first, we investigate the phase transition and phase diagram of the dyonic black holes. Comparing with previous study that there is no black hole phase transition region for a middle pressure, we find this region can narrow or disappear by fine tuning the coupling parameter. Instead, two first-order phase transitions can be observed. Importantly, we uncover that such novel phase diagram shall lead to a multiple defect curve phenomenon in black hole topology where each dyonic black hole is treated as one defect in the thermodynamical parameter space. By examining the topology, it is shown that there could be one, three, or five black hole states for given pressure and temperature. For each case, the topological number is calculated. Our results show that the topological number always takes value of +1, keeping unchanged even when the multiple defect curves appear. Therefore, our study provides an important ingredient on understanding the black hole thermodynamical topology.			

序号	所有作者	题目	期刊名（Source Title）	联系人
5	Liu, Guo; Zeng, Qi; Tian, Shuhao; Sun, Xiao; Wang, Di; Wu, Qingfeng; Wei, Wei; Wu, Tianyu; Zhang, Yuhao; Sheng, Yanbin; Tao, Kun; Xie, Erqing; Zhang, Zhenxing	Boosting Polysulfide Redox Kinetics by Temperature-Induced Metal-Insulator Transition Effect of Tungsten-Doped Vanadium Dioxide for High-Temperature Lithium-Sulfur Batteries	Small	张振兴
摘要	The practical application of Li-S batteries is still severely restricted by poor cyclic performance caused by the intrinsic polysulfides shuttle effect, which is even more severe under the high-temperature condition owing to the inevitable increase of polysulfides' solubility and diffusion rate. Herein, tungsten-doped vanadium dioxide (W-VO_2) micro-flowers are employed with first-order metal-insulator phase transition (MIT) property as a robust and multifunctional modification layer to hamper the shuttle effect and simultaneously improve the thermotolerance of the common separator. Tungsten doping significantly reduces the transition temperature from 68 to 35 ℃ of vanadium dioxide, which renders the W-VO_2 easier to turn from the insulating monoclinic phase into the metallic rutile phase. The systematic experiments and theoretical analysis demonstrate that the temperature-induced in-suit MIT property endows the W-VO_2 catalyst with strong chemisorption against polysulfides, low energy barrier for liquid-to-solid conversion, and outstanding diffusion kinetics of Li-ion under high temperatures. Benefiting from these advantages, the Li-S batteries with W-VO_2 modified separator exhibit significantly improved rate and long-term cyclic performance under 50 ℃. Remarkably, even at an elevated temperature (80 ℃), they still exhibit superior electrochemical performance. This work opens a rewarding avenue to use phase-changing materials for high-temperature Li-S batteries. Adjustable catalytic activity is an important property for the practical electrocatalysts at high temperature condition. Doping modulates the metal-insulator transition temperature, promotes the tight anchoring of polysulfides on the W-VO_2 catalyst, as well as reduces the overpotential of the sulfur reduction reaction (SRR) and sulfur evolution reaction (SER), fundamentally accelerating the conversion of LiPSs between the liquid and solid phases, and thus suppressing the shuttle effect.image			
6	Wang, Shuo; Chen, Huanyu; Xu, Youkui ; Peng, Guoqiang; Wang, Haoxu; Li, Qijun; Zhou, Xufeng; Li, Zhenhua; Wang, Qian; Jin, Zhiwen	Organic Cation Modulation in Manganese Halides to Optimize Crystallization Process and X-Ray Response Toward Large-Area Scintillator Screen	Small	王倩
摘要	Manganese halides are one of the most potential candidates for large-area flat-panel detection owing to their biological safety and all-solution preparation. However, reducing photon scattering and enhancing the efficient luminescence of scintillator screens remains a challenge due to their uncontrollable crystallization and serious nonradiative recombination. Herein, an organic cation modulation is reported to control the crystallization process and enhance the luminescence properties of manganese halides. Given the industrial requirements of the X-ray flat-panel detector, the large-area A_2MnBr_4 screen (900 cm^2) with excellent uniformity is blade-coated at 60 °C. Theoretical calculations and in situ measurements reveal that organic cations with larger steric hindrance can slow down the crystallization of the screen, thus neatening the crystal arrangement and reducing the photon scattering. Moreover, larger steric hindrance can also endow the material with higher exciton binding energy, which is beneficial for restraining nonradiative recombination. Therefore, the BPP_2MnBr_4 (BPP = $C_{25}H_{22}P^+$) screen with larger steric hindrance exhibits a superior spatial resolution (>20 lp mm^{-1}) and ultra-low detection limit (< 250 nGy_{air} s^{-1}). This is the first time steric hindrance modulation is used in blade-coated scintillator screens, and it believes this study will provide some guidance for the development of high-performance manganese halide scintillators.			
7	Ran, Jiaqi；Chen, Peng；Quan, Xiangning；Si, Mingsu；Gao, Daqiang	Improving the Oxygen Evolution Reaction Kinetics in Zn-Air Battery by Iodide Oxidation Reaction	Small	高大强
摘要	Zinc-air batteries (ZABs) have garnered considerable attention as a highly promising contender in the field of energy storage and conversion. Nevertheless, their performance is considerably impeded by the proliferation of dendrites on the Zinc anode and the slow kinetics of the redox reaction on the air cathode. Herein, taking $Ag_{30\%}$@$LaCoO_3$ ($Ag_{30\%}$@LCO) heterojunction catalyst as the cathode, it is demonstrated that adding KI additives to the alkaline electrolyte can not only enhance the oxygen electrocatalytic reaction but also inhibit the formation of zinc anode dendrites, thereby achieving a comprehensive improvement in the performance of ZABs. Under the action of the KI additive, the optimized $Ag_{30\%}$@LCO catalyst shows a decreased overpotential from 460 to 220 mV at j = 10 mA cm^{-2}, while the assembled ZAB shows reduced charging potential (1.8 V), and long cycle stability (180 h). Furthermore, the morphology characterization results indicate a reduction in dendrites on the Zn anode. Both experimental and calculated results indicate that the presence of I- as a reaction modifier alters the trajectory of the conventional oxygen evolution reaction, resulting in a more thermodynamically favorable pathway. The introduction of KI additives as electrolytes provides a straightforward approach to developing comprehensively improved ZABs. Compared to conventional alkaline electrolytes, the addition of KI electrolyte improves the electrochemical-chemical oxidation reaction of I ions in an alkaline environment, which accelerates charge transfer, reduces reaction overpotential, and inhibits the formation of zinc anode dendrites during the reaction process. image			

文章列表

序号	所有作者	题目	期刊名（Source Title）	联系人
8	Li, Muxuan；Yuan, Junsheng；Jin, Mengjing；Ni, Xia； Chang, Peng； Sun, Guowen； Pan, Xiaojun	Elucidating the Chemical Pre-Lithiation Mechanism of Hard Carbon Anodes for Ultra-high Stability Lithium-Ion Batteries	Small	潘孝军
摘要	The hard carbon (HC) anode materials demonstrate high capacity and excellent rate performance in lithium-ion batteries. However, HC anodes suffer from excessive loss of Li^+ ions during the formation of the solid electrolyte interphase (SEI) film, leading to poor cycling stability, which hinders their large-scale applications. Herein, a facile pre-lithiation strategy is proposed to achieve multi-functional precompensation of carbon nanofibers (CNFs) anodes. Both experimental and density functional theory (DFT) calculation results revealed that the strategy compensated for the loss of Li^+ ions and reacted with four structures of CNFs during pre-lithiation, including tiny graphite domains, C=O-containing functional groups, defects, and micropores. Furthermore, the lithium in pre-lithiated carbon nanofibers (pCNFs) existed in various forms, consisting of LiC_{24} and LiC_{18}, Li-O-C, quasi-metallic lithium, and Li^+ ions. Moreover, the uniformly distributed lithium on the surface of pCNFs induced the formation of denser and more robust LiF/Li_2CO_3-rich SEI film, which promoted Li^+ ions transport. As a result, pCNFs showed more stable cycling performance (369.8 mAh g^{-1}, almost no decay for 1500 cycles). This work provides deeper insight into chemical pre-lithiation and offers a simple and mild strategy for highly stable batteries.			
9	Qi, Yifeng； Li, Fengfeng； Sheng, Hongwei；Zhang, Haoshuo；Yuan, Jiao；Ma, Lingxiao；Bi, Huasheng；Ma, Yuqi；Li, Wenquan；Lan, Wei	Seed-Assisted Reversible Dissolution/Deposition of MnO_2 for Long-Cyclic and Green Aqueous Zinc-Ion Batteries	Small	兰伟
摘要	Manganese oxide (MnO_2) based aqueous zinc-ion batteries (AZIBs) are considered to be a promising battery for grid-scale energy storage. However, they usually suffer from the great challenge of capacity attenuation due to Mn dissolution and irreversible structural transformation. Herein, full use of the shortcomings is made to design high-performance cathode-free AZIBs. Manganese-based Prussian blue analog (Mn-PBA) is selected as a seed layer to provide a stable MnO_2 electrodeposition surface. Thanks to the large specific surface area and manganophilic nature of Mn-PBA, the deposition/dissolution kinetics between Mn^{2+} and MnO_2 are significantly enhanced. Systematic studies revealed the mechanism of MnO_2 deposition-dissolution related to the reversible transformation of manganese oxide hydroxide and zinc hydroxide sulfate hydrate. Based on this, the developed cathode-free AZIBs exhibit outstanding rate performance (with a specific capacity of 273.7 mAh g^{-1} at 1 A g^{-1}) and extraordinary cycle stability (maintaining a specific capacity of 52.3 mAh g^{-1} after 50 000 cycles at 20 A g^{-1}). Furthermore, the AZIBs with non-toxic, biocompatible materials can be directly discarded after use, without causing pollution to the environment, which is expected to help achieve the sustainable development goals.			
10	Li, Fengfeng；Ma, Hongyun；Sheng, Hongwei；Wang, Zhaopeng； Qi, Yifeng； Wan, Daicao；Shao, Mingjiao； Yuan, Jiao； Li, Wenquan；Wang, Kairong；Xie, Erqing；Lan, Wei	Interlayer and Phase Engineering Modifications of K-MoS_2@C Nanoflowers for High-Performance Degradable Zn-Ion Batteries	Small	兰伟
摘要	2D transition metal dichalcogenides (TMDs) have garnered significant interest as cathode materials for aqueous zinc-ion batteries (AZIBs) due to their open transport channels and abundant Zn^{2+} intercalation sites. However, unmodified TMDs exhibit low electrochemical activity and poor kinetics owing to the high binding energy and large hydration radius of divalent Zn^{2+}. To overcome these limitations, an interlayer engineering strategy is proposed where K^+ is preintercalated into K-MoS_2 nanosheets, which then undergo in situ growth on carbon nanospheres (denoted as K-MoS_2@C nanoflowers). This strategy stimulates in-plane redox-active sites, expands the interlayer spacing (from 6.16 to 9.42 Å), and induces the formation of abundant MoS_2 1T-phase. The K-MoS_2@C cathode demonstrates excellent redox activity and fast kinetics, attributed to the potassium ions acting as a structural "stabilizer" and an electrostatic interaction "shield," accelerating charge transfer, promoting $Zn2^+$ diffusion, and ensuring structural stability. Meanwhile, the carbon nanospheres serve as a 3D conductive network for Zn^{2+} and enhance the cathode's hydrophilicity. More significantly, the outstanding electrochemical performance of K-MoS_2@C, along with its superior biocompatibility and degradability of its related components, can enable an implantable energy supply, providing novel opportunities for the application of transient electronics.			
11	Zhengxin Ma, Yuhao Zhang, Qingfeng Wu, Xiaosha Cui, Tianyu Wu, Haiqing Jiang,Xinyi Sui, Kun Tao, Erqing Xie, and Zhenxing Zhang*	Enhancing Energy Density in Aqueous Ammonium-Ion Supercapacitors via $CuCo_2S_4$@MoS_2 Core@Shell Heterostructure Design	SMALL	张振兴
摘要	Aqueous ammonium-ion supercapacitors (AASCs) are recognized for their rapid charge-discharge capability, long cycle life, and excellent power density. However, they still confront the challenges of low energy density. To address the above issue, this work proposes a novel strategy involving the establishment of $CuCo_2S_4$@MoS_2 core@shell heterostructures to enhance the capacity of electrode material. The double electric layer energy storage mechanism of the MoS_2 shell facilitates the storage and provision of a substantial ammonium source for NH^{4+} insertion into $CuCo_2S_4$, thereby enhancing the electrochemical performance of AASCs. The density functional theory (DFT) calculations demonstrate that the $CuCo_2S_4$@MoS_2 core@shell heterostructures exhibit better affinity for NH^{4+} and improved conductivity. Furthermore, the internal electric field at the heterojunction accelerates NH^{4+} transfer, thereby enhancing the pseudocapacitive behavior of $CuCo_2S_4$. Owing to the abundant active sites and pronounced pseudo-capacitance, the $CuCo_2S_4$@MoS_2 electrode achieves a specific capacity of 2045 C g^{-1} at 1 A g^{-1}. With activated carbon (AC) as the negative electrode, the fabricated $CuCo_2S_4$@MoS_2//AC AASC device attains a specific capacity of 591 C g^{-1} and an energy density of 83.23 Wh kg^{-1}. This work presents a promising new strategy for the next generation of AASCs.			

序号	所有作者	题目	期刊名（Source Title）	联系人
12	Su, Meixi; Zhang, Yuhao;Liu, Guo; Jiang, Haiqing; Lin, Yuan;Ding, Yan; Wu, Qingfeng; Wei, Wei; Wang, Xinge; Wu, Tianyu; Tao, Kun; Chen, Changcheng ; Xie, Erqing; Zhang, Zhenxing	Optimizing surface state electrons of topological semi - metal by atomic doping for enhanced hydrogen evolution reaction	SMALL	张振兴
摘要	Topological materials carrying topological surface states (TSSs) have extraordinary carrier mobility and robustness, which provide a new platform for searching for efficient hydrogen evolution reaction (HER) electrocatalysts. However, the majority of these TSSs originate from the sp band of topological quantum catalysts rather than the d band. Here, based on the density functional theory calculation, it is reported a topological semimetal Pd_3Sn carrying TSSs mainly derived from d orbital and proposed that optimizing surface state electrons of Pd_3Sn by introduction heteroatoms (Ni) can promote hybridization between hydrogen atoms and electrons, thereby reducing the Gibbs free energy (ΔG_H) of adsorbed hydrogen and improving its HER performance. Moreover, this is well verified by electrocatalytic experiment results, the Ni-doped Pd_3Sn ($Ni_{0.1}Pd_{2.9}Sn$) show much lower overpotential (-29 mV vs RHE) and Tafel slope (17 mV dec^{-1}) than Pd_3Sn (-39 mV vs RHE, 25 mV dec^{-1}) at a current density of 10 mA cm^{-2}. Significantly, the $Ni_{0.1}Pd_{2.9}Sn$ nanoparticles exhibit excellent stability for HER. The electrocatalytic activity of $Ni_{0.1}Pd_{2.9}Sn$ nanoparticles is superior to that of commercial Pt. This work provides an accurate guide for manipulating surface state electrons to improve the HER performance of catalysts. It is proposed and reported a strategy involving heteroatoms (Ni) doping to modulate the surface state energy levels of Pd_3Sn, which can enable more surface state electrons to interact with hydrogen, optimize the adsorption of hydrogen intermediates, thereby reducing Gibbs free energy (Δ GH) of adsorbed hydrogen and improving its HER performance image		
13	Jin, Mengjing； Sun, Guowen； Li, Muxuan；Chen, Ru； Song, Jianqiao； Wang, Jiuzhou；Zhao, Jianguo； Zhou, Jinyuan； Xie, Erqing；Pan, Xiaojun	Understanding the Curvature Effect of FeCo Nanoalloy Encapsulated by Nitrogen-Doped Carbon Nanotubes for High-Performance Lithium–Sulfur Batteries	SMALL	潘孝军
摘要	Well-designed structures of the electrocatalyst provide excellent catalytic activity and high structural stability during the sulfur reduction reaction of Lithium-sulfur batteries (LSBs). In this study, a novel and efficient structure is developed to encapsulate bimetallic FeCo nanoalloy catalysts within N-doped carbon nanotube (NCNT) on carbon nanofibers (FeCo@NCNT/CNFs) using a combination of electrospinning and rapid-cooling techniques. The NCNT matrix with abundant sites not only serves as a high pathway for electron transport during the reaction, but its encapsulation structure also acts as armor to protect the FeCo nanoalloy. Further, the curvature effect of the FeCo@NCNT structure facilitates greater electron transfer from the FeCo nanoalloy to the NCNT, and lowering the reaction barrier for the liquid-solid conversion process. As a result, the S/FeCo@NCNT/CNFs cathode can achieve exceptional cycle performance of 500 cycles at 5 C, with an ultra-low capacity fade rate of 0.031% per cycle. Moreover, even under extreme temperature conditions of -20 and 80 °C, the battery still delivers a specific capacity of 827.16 and 697.46 mAh g^{-1} at 1 C. This work shows an effective insight into enhancing the LiPS conversion kinetics over a wide temperature range in Li-S batteries.			
14	Yang, Xi Yin; Pan, Jiang Long ; Wang, Sha Sha; Chen, Dong ;Wang, Yan Chun ; Wang, Shi Kun ;Cairang, Limao; Zhang, Zhen Xing ;Sun, Geng Zhi;Pan, Xiao Jun ; Zhou, Jin Yuan	Humidity-resistant hydrogen sensors based on rare-earth-doped tin dioxide nanofibers with hydrophobic mesoporous silica sieve encapsulation	SENSORS AND ACTUATORS B-CHEMICAL	周金元
摘要	Air humidity is a major factor that degrades the performance and long-term stability of metal-oxidesemiconductor (MOS) based gas sensors. In this work, we propose an encapsulation strategy by coating a mesoporous silica molecular sieve (SBA-15) on rare earth doped tin oxide (RE-SnO_2) nanofibers for humidityresistant hydrogen detection. In this design, the hydrophobic SBA-15 sieve layer effectively blocks the water molecules without affecting hydrogen diffusion, while the RE dopant greatly improves the responsivity and lowers down the operating temperature of the sensors, As a result, the Er-SnO_2/SBA-15 and Tb-SnO_2/SBA-15 sensors respectively show the maximum response values of 27.71 and 33.68 (to 10 ppm hydrogen at 280°C, 4.67 and 5.67 times that of the bare SnO_2 ones, respectively), short response/recovery time (< 1.0 s / < 1.0 s), as well as a low limit of detection for hydrogen (200 ppb) and a good gas selectivity. Under the protection of the SBA-15 sieve layer, the response retention of the sensors is significantly improved when the humidity increases from 25% to 85% RH (Er-doping, from 38.8% to 60.0%; Tb-doping, form 25.6-57.8%). Besides, further analysis on enhancement mechanism of response indicates that the SBA-15 coating contribute about 1/3 of the response enhancements via its own hydrogen physical adsorption capacity and the induced oxygen vacancies during the calcination processes.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
15	Wang, Xukun; Wang, Xinge; Sui, Xinyi; Zhang, Wenjian; Jiang, Haiqing; Liu, Guo; Li, Bingsheng; Zhou, Jinyuan; Sheng, Yingzhuo; Xie, Erqing; Zhang, Zhenxing	ZnO nanowire/NiO foam 3D nanostructures for high-performance ethylene glycol sensing	SENSORS AND ACTUATORS B-CHEMICAL	张振兴
摘要	Ethylene glycol is widely used in industrial production but poses potential safety hazards to human life and health. Unfortunately, conventional glycol gas sensors have limitations that impede their effectiveness, such as sluggish response rates, high operational temperatures, and complex preparation procedures. A new approach has been explored to address these challenges. A ZnO nanowire/NiO foam nanostructured sensor was developed specifically for rapid ethylene glycol detection. The NiO/ZnO heterojunction-based gas sensor (NZO-6) has inherent p-type gas-sensitive characteristics. Notably, it delivers a response of 58.98-100 ppm of ethylene glycol at a relatively low operating temperature of 175 °C. At a relatively low operating temperature of 175 °C, it exhibits a response of 58.98-100 ppm ethylene glycol, 2.28 times higher than NiO foam, and a fast response/ recovery time (4 s/26 s). This improvement is attributed to the porous structure of NiO foam/ZnO nanowires, with a large specific surface area and numerous oxygen vacancies generated during synthesis. Additionally, the catalysis of Ni metal and the formation of p/n heterojunctions further contribute to the improved sensing performance. This research offers a promising solution for developing high-performance ethylene glycol gas sensors with potential environmental monitoring, industrial safety, and public health applications. Further, this synthesis method provides an effective strategy for constructing other NiO-based heterostructure-based gas sensors.			
16	Weining Liu , Hairong Li , Dandan Huang , Xi Tan , Mingyang Zhao, Qionglin Cheng , Ming Yi , Qi Ding , Yaqian Ren ， Guohan Liu	Efficient triethylamine sensing achieved by in-situ Zn^{2+} doping regulated Mo-MOFs derived $MoO_3/ZnMoO_4$ heterostructures	SENSORS AND ACTUATORS B-CHEMICAL	李海蓉
摘要	Triethylamine (TEA) poses severe safety hazards to industrial production and human health. To accurately detect TEA concentrations and rapidly warn of leakage, a simple reflux condensation method was deployed to successfully incorporate Zn^{2+} in situ into Mo-MOFs precursor in a green, safe, and time-efficient synthesis condition. Subsequently, through calcination, $MoO_3/ZnMoO_4$-X (MMZ-X) were prepared, which exhibited an increased number of defects and enriched porosity, facilitating the access and interaction of TEA with adsorption sites. Simultaneously, rationally built in situ $MoO_3/ZnMoO_4$ heterostructures accelerated carrier migration and induced a drastic resistive change. MMZ-2 demonstrated outstanding TEA sensing performance, exhibiting extremely high sensitivity (R = 572.3, 100 ppm), along with superior selectivity, repeatability and stability, rapid response and recovery times, and a low detection limit. Moreover, the key intrinsic parameters of the heterostructure on the atomic scale were determined by density functional theory (DFT) calculations, providing a detailed elucidation of the sensing enhancement mechanism of the $MoO_3/ZnMoO_4$ heterostructure. The simple and efficient synthesis method and the related mechanistic analysis pave a new path for designing highperformance TEA gas sensors with practical applications.			
17	Xiurui Lv, Guipeng Liu, Bangyao Mao, Heyuan Huang, Guijuan Zhao and Jianhong Yang	α-In_2Se_3/Nb-doped $MoSh_2$ heterojunction: a first-principles study	Semiconductor Science and Technology	刘贵鹏
摘要	The α-In_2Se_3 material is a two-dimensional ferroelectric semiconductor whose structural asymmetry gives it spontaneous polarization properties, and exhibits a direct bandgap structure when it is multilayered. α-In_2Se_3 is an n-type semiconductor, which is usually used in experiments to form heterojunctions with p-type semiconductors to prepare photodetectors. In this paper, we designed α-In_2Se_3/Nb-doped MoS_2 heterojunction, because Nb doping is a good p-type dopant for MoS_2. Our research shows that: the heterojunction exhibits type-II band alignment; the band offset can be changed by the out-of-plane polarization direction; doping can modulate the Fermi energy level position of MoS_2 and thus further modulate the band alignment and band offset. The α-In_2Se_3/Nb-doped MoS_2 heterojunction is expected to be applied to the field of photodetectors, and we proposed a method to adjust the band alignment of the heterojunction by adjusting the doping concentrations.			
18	Cao, Jian;Bai, Yujie; Yang, Jianhong	Analytical models of the electric field and carrier transit time in the base of bipolar junction transistors	Semiconductor Science and Technology	杨建红
摘要	The conventional theory of the bipolar junction transistor (BJT) does not clarify the electric field and its effect on the carrier transit in the uniformly doped base region, although the electric field is considered to be a second-order effect at high-level injection. In this study, analytical models of the carrier distribution, electric field, and carrier transit time in the base region are developed without making additional assumptions. It is found that the electric field may change direction, from forward to reverse, as long as the injection level reaches a criterion, affecting the carrier transport behavior. The models are based on the renovated p-n junction theory, provide insight into the carrier transit and are able to cover all levels of injection without the need to handle the low- and high-level injection separately. These models hold significance in retrieving the theoretical integrity of bipolar junction devices, and can be useful for further investigation in structure design, capacitance control, and AC performance optimization of the p-n junction-based device.			

序号	所有作者	题目	期刊名（Source Title）	联系人
19	Wanting Wei, Guijuan Zhao, Jiande Liu, Xingliang Wang and Guipeng Liu	Study of the photoluminescence properties of GaN irradiated with low fluence Ta ions	Semiconductor Science and Technology	赵桂娟
摘要	The irradiation influences the properties of GaN. We studied the irradiation of n-type, p-type, and i-type GaN with 2.896 GeV Ta ions, with experimental irradiation fluence of 3×10^8, 3×10^9, and 2×10^{10} cm^{-2}, respectively. Low fluence ion irradiation of GaN enhances the luminescence performance of the samples and releases stress between GaN and the sapphire substrate. We demonstrate by characterizing GaN that this is due to the displacement of Ga or N atoms repairing the defects caused by the entry of irradiated ions, thus enhancing the performance of GaN. This provides a reference for low fluence irradiation of GaN.			
20	Ziwei Zhou, Guipeng Liu, and Guijuan Zhao	Temperature- and gate voltage-dependent I-V modeling of GaN HEMTs based on ASM-HEMT	Semiconductor Science and Technology	刘贵鹏
摘要	In this paper, a temperature- and gate voltage-dependent current-voltage (I-V) model for gallium nitride (GaN) high electron mobility transistors (HEMTs) devices is studied. To help researchers and designers simulate devices in the absence of experimental data and improve the parameter extraction efficiency, the temperature and gate voltage dependence of mobility are discussed and incorporated into the proposed model, which is revised from the standard advanced SPICE model (ASM) for GaN HEMTs. The mobility variations with the gate voltage from -2 V to 6 V and the temperature from 10 K to 1000 K are analyzed. The simulation results of our model are compared with the standard ASM-HEMT model, and the output and transfer characteristics of the device from 270 K to 420 K are simulated. Therefore, our model may simulate various applications of GaN HEMTs at different gate voltages and temperatures in the early stages of design and research.			
21	Wanting Wei, Guijuan Zhao, Xiacong Liu, Xiurui Lv, Xingliang Wang and Guipeng Liu	WSe_2/n-GaN and WSe_2/p-GaN heterojunction band alignment	Semiconductor Science and Technology	赵桂娟
摘要	In this work, we measured the band alignment of 2D/3D heterostructures of WSe_2 on n-doped, p-doped, and intrinsic GaN by X-ray photoelectron spectroscopy. The WSe_2/n-GaN heterojunction exhibits type-II band alignment, with measured valence band offset (VBO) and conduction band offset (CBO) values of 2.28 ±0.15 eV and 0.96 ±0.15 eV, respectively. On the other hand, the WSe_2/p-GaN heterojunction shows type-I band alignment, with measured VBO and CBO values of 0.1 ± 0.15 eV and 1.22 ± 0.15 eV, respectively. The results show that doping has a significant effect on the arrangement of the energy bands of the heterostructure, and provides a reference for device applications based on heterojunctions.			
22	Ze-Zhou Zhang; Qing-Shou Tan; Wei Wu	Statistics of quantum heat in the Caldeira-Leggett model	PHYSICAL REVIEW E	吴威
摘要	Nonequilibrium fluctuation relation lies at the heart of the quantum thermodynamics. Many previous studies have demonstrated that the heat exchange between a quantum system and a thermal bath initially prepared in their own Gibbs states at different temperatures obeys the famous Jarzynski-Wójcik fluctuation theorem. However, this conclusion is obtained under the assumption of Born-Markovian approximation. In this paper, going beyond the Born-Markovian limitation, we investigate the statistics of quantum heat in an exactly non-Markovian relaxation process described by the well-known Caldeira-Leggett model. It is revealed that the Jarzynski-Wójcik fluctuation theorem breaks down in the strongly non-Markovian regime. Moreover, we find the steady-state quantum heat within the non-Markovian framework can be widely tunable by using the quantum reservoir-engineering technique. These results are sharply contrary to the common Born-Markovian predictions. Our results presented in this paper may update the understanding of the quantum thermodynamics in strongly coupled and low-temperature systems. Moreover, the controllable heat may have some potential applications in improving the performance of a quantum heat engine.			
23	Liu, Chang; Dong, Jia-Qi; Yu Lian-Chun; Huang Liang	Continuum percolation of two-dimensional adaptive dynamics systems	Physical Review E	董家奇
摘要	The percolation phase transition of a continuum adaptive neuron system with homeostasis is investigated. In order to maintain their average activity at a particular level, each neuron (represented by a disk) varies its connection radius until the sum of overlapping areas with neighboring neurons (representing the overall connection strength in the network) has reached a fixed target area for each neuron. Tuning the two key parameters in the model, i.e., the density defined as the number of neurons (disks) per unit area and the sum of the overlapping area of each disk with its adjacent disks, can drive the system into the critical percolating state. These two parameters are inversely proportional to each other at the critical state, and the critical filling factors are fixed about 0.7157, which is much less than the case of the continuum percolation with uniform disks. It is also confirmed that the critical exponents in this model are the same as the two-dimensional standard lattice percolation. Although the critical state is relatively more sensitive and exhibits long-range spatial correlation, local fluctuations do not propagate in a long-range manner through the system by the adaptive dynamics, which renders the system overall robust against perturbations.			

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序号	所有作者	题目	期刊名 (Source Title)	联系人
24	Ke Wang and Yin Zhong	Frequency modulation of gravitational waves by ultralight scalar dark matter	PHYSICAL REVIEW D	钟寅
摘要	The oscillating pressure of ultralight scalar dark matter (DM) can induce the oscillation of the local gravitational potential. Similarly to the time-dependent frequency shift for the pulse signals of pulsars, the oscillation of the local gravitational potential can induce a time-dependent frequency shift (or frequency modulation) for quasimonochromatic gravitational wave (GW) signals from Galactic white dwarf (WD) binaries. To make this effect detectable, we suppose that some Galactic WD binaries are located in DM clumps/subhalos where the energy density of DM is about 8 orders of magnitude higher than at the position of the Earth. Turning to the Fisher information matrix, we find that an amplified GW frequency modulation induced by ultralight scalar DM with a mass of $m=1.67\times10^{-23}$–4.31×10^{-23} eV/c^2 can be detected by LISA.			
25	Qin Tan, Wen-Di Guo, Yu-Peng Zhang, and Yu-Xiao Liu	Characteristic modes of a thick brane: Resonances and quasinormal modes	PHYSICAL REVIEW D	刘玉孝
摘要	In this work, we investigate the gravitational quasinormal modes (QNMs) and the gravitational resonances of a thick brane model. We use the asymptotic iteration and shooting methods to obtain the quasinormal frequencies (QNFs) of the brane. On the other hand, we investigate the resonances and their evolution numerically. The results show that the oscillations of the resonances equal (up to numerical error) the real parts of the QNFs, while the damping rates of the resonances equal the imaginary parts of the QNFs. The QNMs and resonances-both of them can be regarded as the characteristic modes of the thick brane-are closely related with each other. In addition, the lifetime of these QNMs could be very long, although perhaps they might be detected in a future accelerator or gravitational wave detector.			
26	Yu-Qi Dong, Yu-Qiang Liu, and Yu-Xiao Liu	Polarization modes of gravitational waves in generalized Proca theory	PHYSICAL REVIEW D	刘玉孝
摘要	In this paper, we study polarization modes of gravitational waves in generalized Proca theory in the homogeneous and isotropic Minkowski background. The results show that the polarizations of gravitational waves depend on the parameter space of this gravity theory and can be divided into quite rich cases by parameters. In some parameter space, it only allows two tensor modes, i.e., the + and × modes. In some parameter space, besides tensor modes, it also allows one scalar mode, or two vector (vector-x and vector-y) modes, or both one scalar mode and two vector modes. The scalar mode is a mixture mode of a breathing mode and a longitudinal mode, or just a pure breathing mode. Interestingly, it is found that the amplitude of the vector modes is related to the speed of the tensor modes. This allows us to give the upper bound of the amplitude of the vector modes by detecting the speed of the tensor modes. Specifically, if the speed of tensor modes is strictly equal to the speed of light, then the amplitude of vector modes is zero.			
27	Yu-Qi Dong, Yu-Qiang Liu, and Yu-Xiao Liu	Polarization modes of gravitational waves in general modified gravity: General metric theory and general scalar-tensor theory	PHYSICAL REVIEW D	刘玉孝
摘要	In this paper, we establish a unified parametrized framework for analyzing the polarization modes of gravitational waves in the general metric theory (where gravity is only described by the metric) and the general scalar-tensor theory (where gravity is described by the metric and an additional scalar field). Specifically, we study the polarization modes of gravitational waves in the most general metric theory and general scalar-tensor theory that satisfy the following conditions: (1) Spacetime is four-dimensional; (2) The theory satisfies the principle of least action; (3) The theory is generally covariant; (4) The action describing a free particle is R ds. We find that the polarization modes of gravitational waves in the theory satisfying the above conditions depend on the selection of parameters in the framework, and the theory allows for up to all six polarization modes. Once we have established our framework, the analysis of the polarizations of gravitational waves in specific theories will depend on determining the corresponding parameters within our framework. We also find that the polarization modes of gravitational waves in the general metric theory and the general scalar-tensor theory that satisfy the conditions also have some interesting universal properties.			
28	Tian-Xiang Ma, Chen Liang, Ji-Rong Ren, and Yong-Qiang Wang	Dirac-Proca stars	PHYSICAL REVIEW D	任继荣
摘要	We consider a Dirac-Proca star (DPS) model that consists of the Einstein gravity in four-dimensional spacetime, a Proca field, and two Dirac fields through minimal coupling. By numerically solving this model, we obtain two types of solutions: synchronized frequency solutions and nonsynchronized frequency solutions. We find that in the case of two kinds of matter fields, different families of solutions can be obtained in both synchronized and nonsynchronized frequency cases, and the two families can shift to each other when certain parameters are changed. Moreover, we calculate the binding energy of multifield solutions and give the relationship between binding energy E and synchronized frequency ω over tilde (nonsynchronized frequency ω_p).			

序号	所有作者	题目	期刊名 (Source Title)	联系人
29	Jun-Ru Chen, Long-Xing Huang, Li Zhao, and Yong-Qiang Wang	Tidal Love numbers of axion stars	Physical Review D	王永强
摘要	We investigate spherically symmetric axion stars with minimal coupling between a complex scalar field and gravity in a tidal environment. Tidal perturbations are treated as linear, and we calculate the tidal Love numbers for axion stars. The results show that the electric Love numbers of axion stars are positive, while the magnetic Love numbers are negative on the stable branch. The electric tidal Love numbers are much larger than the magnetic ones on the Newtonian stable branch, but only slightly larger on the relativistic stable branch. The relativistic stable branch has much smaller tidal Love numbers than the Newtonian stable branch, indicating weaker deformability of axion stars on the relativistic stable branch. This is due to the fact that axion stars are more compact on the relativistic branch, and thus hardly distorted by tidal forces.			
30	Shao-Wen Wei, Yu-Xiao Liu, and Robert B. Mann	Universal topological classifications of black hole thermodynamics	Physical Review D	魏少文
摘要	In this Letter, we investigate the universal classifications of black hole states by considering them as topological defects within the thermodynamic parameter space. Through the asymptotic behaviors of the constructed vector, our results indicate the existence of four distinct topological classifications, denoted as W^{1-}, W^{0+}, W^{0-}, and W^{1+}. Within these classifications, the innermost small black hole states are characterized as unstable, stable, unstable, and stable, respectively, while the outermost large ones exhibit an unstable, unstable, stable, and stable behavior. These classifications also display contrasting thermodynamic properties in both low and high Hawking temperature limits. Furthermore, we establish a systematic ordering of the local thermodynamically stable and unstable black hole states as the horizon radius increases for a specific topological classification. These results reveal the universal topological classifications governing black hole thermodynamics, providing valuable insights into the fundamental nature of quantum gravity.			
31	Chen, Ke; Wei, Shao-Wen	Motion of spinning particles around a polymer black hole in loop quantum gravity	PHYSICAL REVIEW D	魏少文
摘要	In the curved spacetime background, the trajectory of a spinning test particle will deviate from the geodesic. Using the effective potential method, we study the motion of a spinning test particle on the equatorial plane of a polymer black hole in loop quantum gravity described by the Mathisson-Papapetrou-Dixon equations with minimal spin-gravity interaction. We find that for the bounded orbits in the radial direction, the particle's motion is timelike when its spin is small. The radial range of the orbit and its eccentricity decrease with the loop quantum gravity parameter. However, when the particle takes a large enough spin, we observe an interesting phenomenon that the timelike and spacelike motions alternately appear while are separated by a critical radius. Outside the critical radius, the motion is timelike; however inside it is spacelike, and on the radius r_c it is null. This property shares similarities with the event horizon radius. However, unlike the event horizon radius, the value of r_c is related to both the particle's motion and the black hole parameters. To explore more observable effects of the loop quantum gravity parameter on the motion of the spinning particle, we focus our attention on the circular orbits, particularly the innermost stable circular orbits, near the black hole. The result shows that for the same spin, there are two different innermost stable circular orbits, one with a larger radius and the other with a smaller radius. Both the radii decrease as the loop quantum gravity parameter increases. More significantly, with the increase of the spin of the particle, the small innermost stable circular orbit transition from timelike to spacelike, while the one with large radius does not. Instead, it terminates at a certain value of spin. Furthermore, we identify the existence of a minimal spin value, below which the innermost stable circular orbits maintain a timelike motion irrespective of the loop quantum gravity parameter. All the results present the significant influences of the loop quantum gravity parameter on the motion of the spinning particles.			
32	Wu, Shan-Ping; Wei, Shao-Wen	Thermodynamical topology of quantum BTZ black hole	PHYSICAL REVIEW D	魏少文
摘要	Among the study of black hole thermodynamics, topology offers a novel approach and perspective for classifying black hole systems. In this work, we explore the thermodynamical topology of the quantum Bañados-Teitelboim-Zanelli(BTZ) black hole by employing the concept of the generalized free energy. To fully characterize the thermodynamics, we introduce two distinct topological numbers. The first one is determined by an expression, denoted by z, derived from the free energy. Although it can provide us with some local physical explanations, sufficient physical significance still lacks from a global perspective. On the other hand, the second topological number is based on the entropy expression of the generalized free energy, leading to a more meaningful interpretation of its physical implications. This result highlights the natural choice of entropy as the domain variable for the generalized free energy. Regarding the second topological number, our analysis reveals a topological transition that is associated with the thermodynamical stability of the "cold" black hole state of the quantum BTZ black hole. And the thermodynamical topology of the BTZ black hole and quantum BTZ black hole can be different, which implies a significant impact of quantum effects on thermodynamics. Furthermore, our study suggests the existence of topological numbers beyond the conventional values of ±1, 0.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
33	Shao-Wen Wei, Yuan-Chuan Zou, Yu-Peng Zhang, and Yu-Xiao Liu	Constraining black hole parameters with the precessing jet nozzle of M87*	PHYSICAL REVIEW D	魏少文

摘要 Recently, Cui *et al*. [Nature (London) 621, 711 (2023)] reported that the jet nozzle of M87* exhibits a precession with a period of approximately 11 years. This finding strongly suggests that the supermassive black hole in the core of M87 galaxy is a spinning black hole with a tilted accretion disk. In this paper, our aim is to utilize these observations to preliminarily constrain the parameters of the black hole by using the characteristics of the geodesic motion. Firstly, we investigate the properties of the spherical orbits and the innermost stable spherical orbits with constant radius. The corresponding angular momentum, energy, and Carter constant for both prograde and retrograde orbits are calculated. We find that, compared to equatorial circular orbits, these quantities exhibit significant differences for fixed tilt angles. Moreover, the Carter constant takes positive values for nonvanishing tilt angles. Notably, the presence of misalignment of the orbit angular momentum and black hole spin leads to a precession effect in these spherical orbits. We then make use of these spherical orbits to model the warp radius of the tilted accretion disk, which allows us to determine the corresponding precession period through the motion of massive particles. Further comparing with the observation of M87*, the relationship between the black hole spin and the warp radius is given, through which if one of them is tested, the other one will be effectively determined. Additionally, our study establishes an upper bound on the warp radius of the accretion disk. These findings demonstrate that the precession of the jet nozzle offers a promising approach for testing the physics of strong gravitational regions near supermassive black holes.

序号	所有作者	题目	期刊名（Source Title）	联系人
34	Zi-han Zhang,, Bin Liu , Sheng-hua Yu and Jie Yang	Gravitational wave forms of galactic compact binaries with mass-transfer correction	PHYSICAL REVIEW D	杨捷

摘要 In this paper, we focus on the effect of mass -transfer between compact binaries like neutron star -neutron star systems and neutron star -white dwarf systems on gravitational waves (GWs). We adopt the mass quadrupole formula with 2.5 order post -Newtonian approximation to calculate the GW radiation and the orbital evolution. After a reasonable discussion of astrophysical processes concerning our scenario, two kinds of mass -transfer models are applied here. One is the mass overflow of the atmosphere, where the companion star orbits into the primary 's Roche limit and its atmosphere overflows into the common envelope. The other one is the tidal disruption of the core, which is viewed as incompressible fluid towards the primary star, and in the near region branches into an accretion disk and direct accretion flow. Viewing this envelope and as a background, the GW of its spin can be calculated as a rotating nonspherically symmetric star. We eventually obtain the corrected gravitational waveform templates for different initial states in the inspiral phase.

序号	所有作者	题目	期刊名（Source Title）	联系人
35	Teng, Hou-Qiang; Dong, Jia-Qi; Wang, Yisen; Huang, Liang; Xu, Peng	Damping separation of finite open systems in gravity-related experiments in the free molecular flow regime	Physical Review D	黄亮

摘要 The residual gas damping of the test mass (TM) in the free molecular flow regime is studied in the finite open systems for high-precision gravity-related experiments. Through strict derivation, we separate the damping coefficients for two finite open systems, i.e., the biplate system and the sensor core system, into base damping and diffusion damping. This elucidates the relationship between the free damping in the infinite gas volume and the proximity damping in the constrained volume, unifies them into one microscopic picture, and allows us to point out three pathways of energy dissipation in the biplate gap. We also provide the conditions that need to be met to achieve this separation. In applications, for space gravitational wave detection, our results for the residual gas damping coefficient for the 4TM torsion balance experiment are the closest to the experimental and simulation data compared to previous models. For the LISA mission, our estimation for residual gas acceleration noise at the sensitive axis is consistent with the simulation result, within about 5% difference. In addition, in the test of the gravitational inversesquare law, our results suggest that the constraint on the distance between TM and the conducting membrane can be reduced by about 28%.

序号	所有作者	题目	期刊名（Source Title）	联系人
36	Sen Yang, Wen-Di Guo, Qin Tan, Li Zhao, and Yu-Xiao Liu	Parametrized quasinormal frequencies and Hawking radiation for axial gravitational perturbations of a holonomy-corrected black hole	Physical Review D	赵力

摘要 As the fingerprints of black holes, quasinormal modes are closely associated with many properties of black holes. Especially, the ringdown phase of gravitational waveforms from the merger of compact binary components can be described by quasinormal modes. Serving as a model-independent approach, the framework of parametrized quasinormal frequencies offers a universal method for investigating quasinormal modes of diverse black holes. In this work, we first obtain the Schrodinger-like master equation of the axial gravitational perturbation of a holonomy-corrected black hole. We calculate the corresponding quasinormal frequencies using the Wentzel-Kramers-Brillouin approximation and asymptotic iteration methods. We investigate the numerical evolution of an initial wave packet on the background spacetime. Then, we deduce the parametrized expression of the quasinormal frequencies and find that $\mathbf{r_0} \leq 10^{-2}$ is a necessary condition for the parametrized approximation to be valid, where $\mathbf{r_0}$ is the quantum parameter. We also study the impact of the parameter $\mathbf{r_0}$ on the greybody factor and Hawking radiation. With more ringdown signals of gravitational waves detected in the future, our research will contribute to the study of the quantum properties of black holes.

序号	所有作者	题目	期刊名（Source Title）	联系人
37	Hai-Long Jia, Wen-Di Guo, Qin Tan, and Yu-Xiao Liu	Quasinormal ringing of thick braneworlds with a finite extra dimension	Physical Review D	刘玉孝

摘要 In this work, we investigate the quasinormal modes of the Poincaré thick brane with a finite extra dimension. Unlike the case with an infinite extra dimension, the gravitational effective potential exhibits three distinct shapes within different ranges of the parameter n in the warp factor: harmonic oscillator potential, Pöschl-Teller potential, and volcanolike potential. We then study various types of perturbations in this system. Utilizing a combination of analytical, semianalytical, and numerical methods, we obtain the quasinormal modes of the perturbed fields. Our findings reveal a set of discrete quasinormal modes for the thick brane, similar to those of black holes. Interestingly, when n=1, the quasinormal modes exhibit purely imaginary behavior. This study may provide a new way to detect the existence of extra dimensions.

序号	所有作者	题目	期刊名（Source Title）	联系人
38	Xiao-Bin Lai, Yu-Qi Dong, Yu-Qiang Liu, and Yu-Xiao Liu	Polarization modes of gravitational waves in general Einstein-vector theory	Physical Review D	刘玉孝

摘要 We study the polarization modes of gravitational waves in general Einstein-vector theory with an arbitrary constant background vector field under a Minkowski background. We compare these polarization modes with those of other vector-tensor theories and constrain the parameter spaces based on the gravitational-wave event GW170817 with its electromagnetic counterpart GRB170817A and observations of pulsar timing arrays. The presence of the background vector field leads to the anisotropy of space and a rich variety of gravitational wave contents. Our results reveal that the polarization modes of gravitational waves depend on the parameter spaces. There are at least two and at most five independent polarization modes in one parameter space. In different parameter spaces, some mixture modes are allowed, including tensor-vector, tensor-scalar, tensor-vector-scalar, vector-scalar, and scalar-scalar mixture modes, as well as five independent modes (excluding $\boldsymbol{P}_0$): $\boldsymbol{P}_{+}$, $\boldsymbol{P}_{\mathrm{x}}$, $\boldsymbol{P}_{\mathrm{xy}}$, $\boldsymbol{P}_{\mathrm{y}}$, and $\boldsymbol{P}_{\mathrm{b}}$. In all regions of the parameter spaces, there are always two tensor modes, which can be either independent of or mixed with other modes. The independent $\mathrm{P_b}$ mode consistently exhibits the same speed as light. If the speed of tensorial gravitational waves strictly equals that of light, only the $\boldsymbol{P}_{+}$, $\boldsymbol{P}_{\mathrm{x}}$, and $\boldsymbol{P}_{\mathrm{b}}$ modes are permitted. Furthermore, through comparisons of some vector-tensor theories and based on the observations of gravitational waves, the $\boldsymbol{P}_{\mathrm{b}}$ mode is expected to be allowed.

序号	所有作者	题目	期刊名（Source Title）	联系人
39	Hong-Yue Jiang, Meng-Ting Wang, and Yu-Xiao Liu	Holographic complexity and phase transition for AdS black holes	Physical Review D	刘玉孝

摘要 Recently, the complexity equals any gravitational observable conjecture has been proposed in [Phys. Rev. Lett. 128, 081602 (2022)], which is an extension of the complexity equals volume proposal. These gravitational observables are referred to as generalized volumes. In this paper, we investigate the generalized volume complexity for black holes with one or two horizons respectively. We verify that the turning time is universal and independent of the Cauchy horizon. Not only does this phase transition occur once, but it may also occur two or more times depending on the number and height of the effective potential peaks. On the other hand, we confirm that the generalized volume complexity can be divided based on the shape of the effective potential. We then discuss the nonsmooth transition from the Reissner–Nordström–anti-de Sitter(AdS) black hole to the Schwarzschild-AdS black hole.

序号	所有作者	题目	期刊名（Source Title）	联系人
40	Bo Zhang, Wei Ren, Shengyu Yang, Qifeng Kuang, Da Li, Xin Liu, Anmin Zhang, Hua Pang, Liyun Tang, Liang Qiao, Fashen Li, and Zhiwei Li	Mössbauer spectroscopy study of magnetostructural and spin-state transitions in the breathing pyrochlore $LiFeCr_4O_8$	PHYSICAL REVIEW B	李志伟

摘要 We report on investigations of the complex magnetostructural and spin-state transitions in the breathing pyrochlore $LiFeCr_4O_8$ by means of magnetization, Mossbauer spectroscopy, and density functional theory (DFT) calculations. Three transitions corresponding to the ferrimagnetic transition at T_N similar to 94 K, the spin-gap transition at T_{SG} similar to 50 K, and the magnetostructural transition at T_{MS} similar to 19 K were observed from the $\chi(T)$ curve, whereas only T_N and T_{MS} were evidenced for the Fe site from our Mossbauer measurements, suggesting that the spin-gap transition is absent at the Fe site. This indicates that the spin-gap transition is an effect of the breathing Cr_4 lattice, in agreement with our DFT calculations from which we see nearly decoupled electronic states for the FeO_4 and CrO_6 units. From the temperature dependence of the hyperfine magnetic field, we also observed a spin-state transition for the Fe spins at T_{MS} consistent with earlier neutron diffraction measurements. These local characteristics are believed to be important for a complete understanding of the complex magnetostructural coupling effects observed in similar systems.

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序号	所有作者	题目	期刊名（Source Title）	联系人
41	Wei-Wei Yang, Hong-Gang Luo and Yin Zhong	Bose metal in an exactly solvable model with infinite-range Hatsugai-Kohmoto interaction	PHYSICAL REVIEW B	钟寅

摘要 In a conventional boson system, the ground state can either be an insulator or a superfluid (SF) due to the duality between particle number and phase. This paper reveals that the long-sought Bose metal (BM) state can be realized in an exactly solvable interacting bosonic model, i.e., the Bose-Hatsugai-Kohmoto (BHK) model, which acts as the nontrivial extension of Bose-Hubbard (BH) model. By tuning the parameters such as bandwidth W, chemical potential μ, and interaction strength U, a BM state without any symmetry breaking can be accessed for a generic W/U ratio, while a Mott insulator (MI) with integer boson density is observed at small W/U. The quantum phase transition between the MI and BM states belongs to the universality class of the Lifshitz transition, which is further confirmed by analyzing the momentum-distribution function, the Drude weight, and the SF weight. Additionally, our investigation at finite temperature reveals similarities between the BM state and the Fermi liquid, such as a linear-T dependent heat capacity ($C_v \sim \gamma T$) and a saturated charge susceptibility ($\chi_c \sim$ constant) as T approaches zero. Comparing the BM state with the SF state in the standard BH model, we find that the key feature of the BM state is a compressible total wavefunction accompanied by an incompressible zero-momentum component. Given that the BM state prevails over the SF state at any finite U in the BHK model, our paper suggests the possibility of realizing the BM state with on-site repulsion interactions in momentum space.

序号	所有作者	题目	期刊名（Source Title）	联系人
42	Tengfei Zhang, Chaozhong Li, Qian Zhao, Zimu Li, Quwen Wang, Guoqiang Yu, Xiufeng Han, Guozhi Chai, Senfu Zhang, Qingfang Liu, Jianbo Wang, and Jinwu Wei	Spin wave dispersion in perpendicularly magnetized synthetic antiferromagnets	Physical Review B	魏晋武

摘要 The spin wave is a promising candidate medium to be used as an information carrier and for processing. Knowledge of the spin wave dispersion relation is a prerequisite for its application and the design of devices. Here, we report on spin wave dispersion in perpendicularly magnetized synthetic antiferromagnets (p-SAFs), consisting of two CoFeB layers and a thin W spacer layer. The Brillouin light scattering technique is employed to measure the spin wave dispersion relations as a function of the in-plane magnetic field and wave vector. Two resonance modes are observed in the finite range of the magnetic field, in which the configuration of the magnetic moments in two CoFeB layers can be divided into antiferromagnetic and ferromagnetic states. In addition, we observe a T-type region, where the magnetization in one CoFeB layer lies in the direction of the in-plane magnetic field and the other stays in the out-of-plane direction. The dependences of the frequency on the wave vector demonstrate the spin wave propagation in this case is reciprocal. We also theoretically derive the spin wave dispersion relation for p-SAFs based on the Landau-Lifshitz equation, which agree well with the experimental results.

序号	所有作者	题目	期刊名（Source Title）	联系人
43	Yiwen Dong, Bo Zhang, Yantao Cao, Hanjie Guo, Wei Ren, Anmin Zhang, ZhenHua Li, Zhengqing Wei, Haoliang Liu, Liyun Tang, Hua Pang, Fashen Li, and Zhiwei Li	Simple yet clear local evidence for the tetrahedral triple-Q magnetic ground state in the triangular antiferromagnet $Co_{1/3}NbS_2$	PHYSICAL REVIEW B	李志伟

摘要 In this work, we demonstrate a simple yet effective procedure for identifying the exotic tetrahedral triple-Q magnetic ordering over the domain averaged collinear single-Q magnetic state for the triangular antiferromagnet $Co_{1/3}NbS_2$. Our density functional theory (DFT) calculations show that the hyperfine magnetic field exhibits a significant anisotropic dependence on the angle between the spin direction and the c-axis, which means that the atoms with different spin directions in the triple-Q state can be divided into two subgroups with a ratio of 1:3 that can be distinguished by local probing methods. Mossbauer spectroscopy measurements on $(Co_{0.99}{}^{57}Fe_{0.01})_{1/3}NbS_2$ crystals confirm exactly our DFT predictions and thus give possible evidence of the tetrahedral triple-Q magnetic state. These results provide important insights into the magnetic ground state of $Co_{1/3}NbS_2$, which shall shed light on the understanding of the anomalous Hall effect in $Co_{1/3}NbS_2$ and other related materials.

序号	所有作者	题目	期刊名（Source Title）	联系人
44	Ken Chen , Qiang Luo , Bin Xi, Hong-Gang Luo,and Jize Zhao	Topological phase transitions and thermal Hall effect in a noncollinear spin texture	PHYSICAL REVIEW B	赵继泽

摘要 The noncollinear spin textures provide promising avenues to stabilize exotic magnetic phases and excitations. They have attracted vast attention in the past decades due to their nontrivial band topology. Distinct from the conventional route of involving the Dzyaloshinskii-Moriya interaction in a honeycomb magnet, the interplay of bond -dependent Kitaev and Γ interactions, originating from the spin -orbit coupling and octahedra crystal field in real materials, has demonstrated to be another source to generate noncollinear spin textures with multiple spins in a magnetic unit cell. Notably, earlier works have revealed a triple-meron crystal (TmX) consisting of 18 spins in the frustrated Kitaev-Γ model. Aligning with previous efforts, here we attempt to identify that the TmX hosts several peculiar features with the help of the linear spin -wave theory. To begin with, the symmetric anisotropic exchanges are beneficial for the existence of nonreciprocal magnons, which are stabilized by an external magnetic field. Further, within the regime of TmX, successive topological phase transitions occur, accompanied by the changes of Chern number in value and thermal Hall conductivity in sign. In addition, the topological nature of magnons is also verified by the onset of chiral edge modes in a nanoribbon geometry. Our findings pave the way to study topological phenomena of noncollinear spin textures in potential Kitaev materials.

序号	所有作者	题目	期刊名（Source Title）	联系人
45	He, Jiajun, Jia, Hao, Chen, Haoxiang, Wang, Tao, Liu, Shuo, Cao, Jianjun, Gao, Zhen, Shang, Ce, Cui, Tie Jun	Mode engineering in reconfigurable fractal topological circuits	PHYSICAL REVIEW B	贾浩

摘要 Circuits can provide a versatile platform for exploring new physics, particularly in probing the topological phases within complex geometries. Fractals, celebrated for their intricate, self-similar duality, and noninteger dimensions, particularly those embedded in complex manifolds, remain uncharted in this context. In our research, we implement Sierpinski fractal topological insulators within reconfigurable fractal topological circuits while expanding the scope to include the cylindrical and toroidal structures. Our approach is grounded in consistency theory and reinforced through experimental verification, confirming the presence of unconventional higher-order topological phenomena referring to the abundance of topological edge and corner modes. Intriguingly, the quantity of these edge and corner modes is proportional to the volume modes relative to the system size, with an exponent aligning with the Hausdorff fractal dimension of the Sierpinski carpet. This study paves the way for a deeper exploration of topological modes within fractal geometries, potentially unlocking new avenues in topological physics.

序号	所有作者	题目	期刊名（Source Title）	联系人
46	Bao-Qing Wang, Can Shao, Takami Tohyama, Hong-Gang Luo, and Hantao Lu	Topological phase in the extended Haldane-Hubbard model with sublattice-dependent repulsion	Physical Review B	陆汉涛

摘要 We study the ground-state phase diagram of the half-filled extended Haldane-Hubbard model on the honeycomb lattice with sublattice-dependent on-site repulsion ($U_{A/B}$) using the exact diagonalization (ED) and mean-field (MF) methods. The resulting phase diagram shows that there is a topologically nontrivial phase with the Chern number C = 1, emerging via the development of the imbalance between U_A and U_B. In this phase, the antiferromagnetic correlations are observed in the ED calculation, in line with the finite antiferromagnetic order obtained by the MF method. The spontaneous symmetry breaking of SU(2) spin rotation in the phase is also identified in the MF level. Distinct from previous studies in which the exotic C = 1 phase relies on the interplay between sublattice-dependent potentials and electronic interactions, our paper presents an alternative way by solely tuning the on-site interactions.

序号	所有作者	题目	期刊名（Source Title）	联系人
47	Bo Wang, Yonghai Guo, Xingrong Qi, Bo Zhang, Zhide Li, Ziyang Hu, Qi Wang, and Jiangwei Cao	Large dampinglike torque contribution originating from the orbital Rashba-Edelstein effect at a Pt/CoO interface	PHYSICAL REVIEW B	曹江伟

摘要 Current-induced spin-orbit torque (SOT) provides an efficient strategy for electrical manipulation of magnetism in spintronic devices. However, despite more than one decade of research for current-induced torque optimization, the charge-to-spin conversion efficiency and the resistivity in the spin-current source materials do not satisfy the requirement for next-generation low-consumption devices. Authors of recent theoretical works have predicted that an oxide or nitride interface can induce orbital angular momentum (OAM) accumulation through the orbital Rashba-Edelstein effect (OREE) and exert orbital torques to the adjacent magnetic layer. Here, we report on the remarkable dampinglike torque contribution from the OREE at the Pt/Co-O interface. In the Co/Co-O/Pt structures, the insertion of a thin natural-oxidized Co-O layer results in the sign reversal of SOT efficiency, suggesting the existence of a competing SOT source. In addition, the SOT efficiency and spin Hall magnetoresistance ratio in the Pt/Co structure were elevated significantly by introducing a Co-O underlayer. Anomalous SOT has also been observed in the Pt/Co/Co-O/Pt structures with perpendicular magnetic anisotropy by using the loop-shift technique and current-induced magnetization switching. After excluding the bulk contribution from the Co-O layer and its possible manipulation to the spin current from the Pt layer, we attribute this anomalous SOT origin to the OREE at the Co-O/Pt interface. In this paper, we not only provide a strategy for generating additional spin current for manipulating the SOT but also demonstrate an important clue toward microscopic understanding of how the out-of-equilibrium OAM interacts with the local magnetization.

序号	所有作者	题目	期刊名（Source Title）	联系人
48	Wei Ren, Helin Mei,Wenbo Sang, Mingshu Tan , Jianguo Si,Miao Liu,Jianting Ji , Feng Jin,Anmin Zhang, and Qingming Zhang	Raman scattering study of electron-phonon coupling in superconducting $LaRu_2P_2$	PHYSICAL REVIEW B	张安民

摘要 $LaRu_2P_2$ shares a similar $ThCr_2Si_2$-type structure with iron pnictides and also shows a superconductivity of 4 K, but possesses quite different electronic properties. The studies of electronic properties and superconductivity in $LaRu_2P_2$ are of particular interest. In this paper, we have conducted a comprehensive Raman scattering study and careful first-principles calculations to explore the electron-phonon coupling (EPC) in $LaRu_2P_2$. We have grown very high-quality $LaRu_2P_2$ superconducting single crystals with a superconducting transition width $\Delta T_c \sim 0.15$ K.. The phonon modes observed in polarized Raman measurements are well assigned with a symmetry analysis. The linewidths of the Raman modes exhibit an anomalous temperature dependence though their Raman frequencies approximately follow the general anharmonic decay process. This allows us to extract the intrinsic phonon broadening caused by EPC, and gives a relatively large EPC constant which is consistent with our first-principles calculations. The estimated $T_c \sim 4.2$ K based on the constant suggests a pairing mechanism associated with EPC in $LaRu_2P_2$.

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序号	所有作者	题目	期刊名 (Source Title)	联系人
49	Wen-Yu Su, Yu-Jing Liu, Nvsen Ma, and Chen Cheng	Probing phase transitions with correlations in configuration space	PHYSICAL REVIEW B	程晨
摘要	In principle, the probability of configurations, determined by the system's partition function or wave function, encapsulates essential information about phases and phase transitions. Despite the exponentially large configuration space, we show that the generic correlation of distances between configurations, with a degree of freedom proportional to the lattice size, can probe phase transitions using importance sampling procedures like Monte Carlo simulations. The distribution of sampled distances varies significantly across different phases, suggesting universal critical behavior for uncertainty and participation entropy. For various classical spin models with different phases and transitions, finite-size analysis based on these quantities accurately identifies phase transitions and critical points. Notably, in all cases, the critical exponent derived from the uncertainty of distances equals the anomalous dimension governing real-space correlation decay. Thus, configuration space correlations, defined by distance uncertainties, share the same decay ratio as real-space correlations, determining the universality class of phase transitions. This work applies to diverse lattice models with different local degrees of freedom, e.g., two levels for Ising-like models, discrete multilevels for q-state clock models, and continuous local levels for the XY model, offering a robust, alternative method for understanding complex phases and transitions.			
50	Chaozhong Li, Zhengyi Li,Mangyuan Ma, Yuping Yao,Huige Ma, Changjun Jiang , C. K. Ong, Fusheng Ma,and Guozhi Chai	Magnon hybridization of vortices with opposite chirality in magnetic thin films	PHYSICAL REVIEW B	柴国志
摘要	We have proposed and demonstrated the hybridization between magnon modes of a magnetic vortex pair (MVP) of opposite chirality. The proposed magnon hybridization in MVP configurations of opposite chirality is realized by micromagnetic simulations. It is found that the hybridization results from the coupling between the breathing mode originating from the individual motion of a single magnetic vortex and the collective mode arising from the overall behavior of the MVP. Then the hybridization of different magnon modes is experimentally observed in the CoZr striped domain thin film systems, in which the MVP configuration exists. Moreover, the hybridization, coupling field, and strength can be modulated by the thickness of the CoZr films, i.e., the dimension of the magnetic vortex. Finally, we investigate the effect of different magnetic parameters on the magnon hybridization, i.e., the exchange constant, perpendicular magnetic anisotropy constant, and saturation magnetization. Our results may deepen the understanding of the hybridization phenomenon of magnons for complex magnetic textures.			
51	Zhang, Quanzhi; Yan, Ze; Ying, Aohua;Zhang, Jianrong; Zhang, Bo; ao, Jiangwei; Si, Mingsu; Xi, Li ; Xue, Desheng; Yang, Dezheng	Measurement of third harmonic voltage in ferromagnet-heavy metal heterostructures	PHYSICAL REVIEW B	杨德政
摘要	The second harmonic voltage has been widely used to measure electrically driven spin torques in ferromagnet- heavy metal heterostructures. Based on the macrospin model, the third harmonic voltage is proposed for studying thermally driven spin torques. Our experiments clearly show that two distinct physical mechanisms dominate such thermal spin torques. The first refers to thermal expansion or contraction, which generates an effective field through the magnetoelastic effect. The second comes from the thermally reduced magnetization of the ferromagnetic layer, which modulates the magnetoresistance of the heterostructure. Our study illustrates the versatile applicability of the third harmonic voltage in investigating the nonlinear effects in ferromagnet-heavy metal heterostructures.			
52	Ming-Jian Gao, Yu-Peng Ma and Jun-Hong An	Majorana modes and their Floquet engineering in a trapped-ion system	Physical Review B	安钧鸿
摘要	Obeying non-Abelian statistics, Majorana fermions holds a promise to implement fault-tolerant quantum computing. It was found that Majorana fermions can be simulated by the zero-energy excitation in a nanowire with strong spin-orbit coupling interacting with an s-wave superconductor under a magnetic field. However, the signal of Majorana fermion in that system is obscured by the disorder in the nanowire and the confinement potential at the wire end. Thus, more controllable platforms are desired to simulate Majorana fermions. We here propose an alternative scheme to simulate the Majorana fermions in a trapped-ion system. Our dimerized-ion configuration permits us to generate the Majorana modes not only at zero energy but also at the nonzero ones, which enlarge the family of Majorana modes and supply another qubit carrier for quantum computing. We also investigate the controllability of the Majorana modes by Floquet engineering. It is found that a widely tunable number of Majorana modes are created on demand by applying a periodic driving on the trapped-ion system. Enriching the platforms for simulating Majorana fermions, our result would open another avenue for realizing fault-tolerant quantum computing.			

序号	所有作者	题目	期刊名 (Source Title)	联系人
53	Wei Jia, Bao-Zong Wang, Ming-Jian Gao, and Jun-Hong An	Unveiling higher-order topology via polarized topological charges	Physical Review B	安钧鸿
摘要	Higher-order topological phases (HOTPs) host exotic topological states that go beyond the traditional bulkboundary correspondence. Up to now, there is still a lack of experimentally measurable momentum-space topological characterization for the HOTPs, which is not conducive to revealing the essential properties of these topological states and also restricts their detection in quantum simulation systems. Here, we propose a concept of polarized topological charges to characterize chiral-symmetric HOTPs in momentum space, which further facilitates a feasible experimental scheme to detect the HOTPs in ^{87}**Rb** cold atomic system. Remarkably, our characterization theory not only shows that the second-order (third-order) topological phases are determined by a quarter (negative eighth) of the total polarized topological charges, but also reveals that the higher-order topological phase transitions are identified by the creation or annihilation of polarized topological charges. Particularly, these polarized topological charges can be measured by pseudospin structures of the systems. Due to theoretical simplicity and observational intuitiveness, this work shall advance the broad studies of the HOTPs in both theory and experiment.			
54	Pei Liu, Bing Lv, Yongzuo Wang, Peng Chen, Lei Wang , and Cunxu Gao	Respective dependencies of conventional and spontaneous exchange biases on spin glass	PHYSICAL REVIEW B	高存绪
摘要	A conventional exchange bias manifests itself as a hysteresis loop shift in systems with an interface between a ferromagnet and an antiferromagnet after field cooling. Due to the complicated magnetic interactions at the interface, a spin glass with disordered and frustrated spin configurations is generated, resulting in the dependencies of the conventional exchange bias mechanism on a spin glass still being elusive. Here, we report that a spin glass, CuMn, exhibits a conventional exchange bias as in interface magnetic systems. More importantly, a spontaneous exchange bias is also observed in the spin glass after zero-field cooling, which is attributed to the response of ferromagnetic clusters embedded in a spin-glass matrix at high magnetic fields that form a unidirectional anisotropy through the interaction between the clusters and the spin-glass matrix. Our results show the relationship between the exchange bias and spin glasses, offering a foundational understanding for exchange bias research.			
55	Tinghai Zhang, Yantao Cao, Bo Zhang, Hanjie Guo, Liang Qiao, Fashen Li, and Zhiwei Li	Short-range order and strong interplay between local and itinerant magnetism in $GeFe_3N$	PHYSICAL REVIEW B	李志伟
摘要	Here, we report on comprehensive structural, magnetic, specific heat, resistivity, and microscopic ^{57}Fe Mössbauer spectroscopy investigations of the $GeFe_3N$ compound. The experimental results indicate that the ground state of $GeFe_3N$ is short-range ordered ferromagnetic (FM) state, where the FM clusters are embedded in the paramagnetic background. Our density functional theory (DFT) calculations have revealed possible orbital order for the FeII site, and the strong interplay between the local moments for the FeI site and the itinerant moments for the FeII site may be responsible for the observed short-range FM order. We believe that these results are crucial for a complete understanding of the peculiar magnetic properties reported for $GeFe_3N$ and may also shed light on the understanding of the complex relationships between the structure and magnetism in related compounds.			
56	Pengju Wang , Peng Chen, Yongzuo Wang, Yu Miao, and Cunxu Gao	Electron-electron interaction correction to the skew scattering contribution to the anomalous Hall effect in ultrathin FeCo films	PHYSICAL REVIEW B	高存绪
摘要	Electron -electron interaction (EEI), a quantum effect that occurs in low-dimensional or disordered systems at low temperatures, is an important issue in electron transport phenomena, especially in the anomalous Hall effect (AHE). Nevertheless, the role of EEI correction to the AHE is overlooked in conventional magnetic metal systems and the scaling exponents of the power-law fits are not consistently at the systems with sufficiently high disorder. Here, we demonstrate that EEI does correct to the AHE and cause ln T -type temperature dependence of sheet resistance R_{xx} (conductance G_{xx}), anomalous Hall resistance R_{AH} , and anomalous Hall conductance G_{AH} in ultrathin high -quality FeCo films in the low -temperature region. Furthermore, the scaling exponent $\gamma \sim 1$ is acquired through the power -law fits of G_{AH} similar to $G_{xx}{}^{\gamma}$ by varying temperature or thickness, suggesting that EEI corrects to skew scattering and definitely results in skew scattering dominating AHE in the bad metal regime($\sigma_{xx} < 1\times 10^4$ S/cm).			

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序号	所有作者	题目	期刊名（Source Title）	联系人
57	Fengrui Zhang, Jianing Wang, Yuchen Ye , Jinxia Yang, Jinxuan Shi , Jianbo Wang , * and Qingfang Liu	Uniform magnetic excitation in antiferromagnetic MnN	PHYSICAL REVIEW B	刘青芳
摘要	Antiferromagnets are considered to be promising materials for future spintronic devices; the simulation and theoretical analysis are important to improve our understanding of the dynamics of antiferromagnetic materials, as relevant experiments are less convenient compared with ferromagnets. MnN is a collinear antiferromagnet noted for its large anisotropy, high Néel temperature, and potential for electrical switching in antiferromagnetic spintronics. In this work, the antiferromagnetic resonance of collinear MnN has been theoretically calculated using the macrospin model. The obtained results are then compared with our simulation performed at the natural atomic order of antiferromagnets, using parameters taken from reported first-principles calculations and experiments. The frequency-field dependence and chirality characteristics of all modes in antiferromagnetic resonance in the case of different external fields applied parallel or perpendicular to the easy axis are investigated in detail. The analytical results derived from the macrospin model show good agreement with the simulated data. In addition, the static magnetic properties of MnN obtained from atomistic simulation closely match the reported experimental or our analytical results. This work helps to understand the dynamics of collinear antiferromagnetic materials.			
58	Lijuan Zhao, Yuzhi Li, Fu Liu, Tong Li, Yongzuo Wang, Xu Liu, Dezheng Yang, Changjun Jiang , and Cunxu Gao	Large unidirectional magnetoresistance from the dual functionality of copper oxide in naturally oxidized light-metal Al/Cu bilayer films	PHYSICAL REVIEW APPLIED	高存绪
摘要	Unidirectional magnetoresistance (UMR) has garnered extensive attention for its rich physics and potential applications. The prevailing belief is that indispensable ferromagnetic films serve as scattering sources of polarized electrons or that noncentrosymmetric systems cause spin band splitting, driving most research toward ferromagnet/normal-metal bilayer films or nonmagnetic Rashba systems. However, our observations reveal a significant UMR in bilayer films consisting solely of the oxidized light metal Al/Cu. Remarkably, the UMR signal of 0.073% is approximately one order of magnitude larger than that of most structures. Such a UMR is attributed to the dual functionality of copper oxide, which not only generates polarized electrons-a recognized function-but also scatters these electrons in a weak magnetization manner. Our findings provide a fresh strategy to generate the UMR, facilitating its application through the use of more readily available materials.			
59	Zu-Jian Ying	Spin winding and topological nature of transitions in the Jaynes-Cummings model with Stark nonlinear coupling	Physical Review A	应祖建
摘要	Besides exploring novel transition patterns, acquiring a full understanding of the transition nature is an ultimate pursuit in studies of phase transitions. The fundamental models of light-matter interactions manifest single-qubit topological phase transitions (TPTs), which call for an analytical demonstration apart from numerical studies. We present a rigorous study of TPTs in the Jaynes-Cummings model generally with Stark nonlinear coupling. In terms of the properties of Hermite polynomials, we show that the topological structure of the eigenfunction has an exact correspondence to the spin winding by nodes, which yields a full spin winding without antiwinding nodes. We find it is the superposition between neighboring Fock states that leads to such a nontrivial spin winding. The spurious fractional contribution to the winding number of the winding angle at infinity is found to be actually an integer. Thus, the phase transitions in the model have the nature of TPTs and the excitation number is endowed as a topological quantum number. The principal transition establishes a paradigmatic case in which a transition is of both the symmetry -breaking Landau class of transition and the symmetry -protected topological class of transition, while conventionally these two classes of transitions are incompatible due to the contrary symmetry requirements. Such a transition-class reconciliation is realized by a preserved higher symmetry (here the parity) which protects the TPTs, while the symmetry breaking involves the subsymmetries. We also explain the origin of unconventional TPTs in the presence of counterrotating terms. Our results may provide deeper insight into the few-body phase transitions in light -matter interactions.			
60	Zu-Jian Ying, Wen-Long Wang, and Bo-Jian Li	Quantum Fisher information and polaron picture for the identification of transition coupling in the quantum Rabi model	Physical Review A	应祖建
摘要	The quantum Rabi model (QRM) is a fundamental model for light-matter interactions. A fascinating feature of the QRM is that it manifests a quantum phase transition which is applicable for critical quantum metrology (CQM). Effective application for CQM needs the exact location of the transition point, however the conventional expression for transition coupling is only valid in the extreme limit of low frequency, while apart from zero frequency an accurate location is still lacking. In the present work we conversely use the quantum Fisher information (QFI) in the CQM to identify the transition coupling, which reveals that transition coupling indeed deviates greatly from the conventional one once a finite frequency is turned on. Polaron picture is applied to analytically reproduce the numeric QFI. An accurate expression for the transition coupling is obtained by inspiration from the revealed fractional-power-law effect of polaron frequency renormalization. From the QFI in the polaron picture we find that the transition occurs around a point where the effective velocity and the susceptibility of the expected value of mode quadrature reach maximum. Our result provides an accurate reference of transition couplings for quantum metrology at nonzero frequencies. The formulation of the QFI in the polaron picture also prepares an analytic method with an accurate compensation for the parameter regime difficult to access for the numerics. Besides the integer/fractional-power-law analysis to extract the underlying physics of transition, the QFI/velocity relation may also add some insight in bridging the QFI and transition observables.			

序号	所有作者	题目	期刊名（Source Title）	联系人
61	Junpeng Liu , Miaomiao Zhao, Yun-Tong Yang, and Hong-Gang Luo	Using nonclassical states to explore the superradiant phase transition in the quantum Rabi model	Physical Review A	罗洪刚
摘要	The ground state of the quantum Rabi model (QRM) exhibits rich nonclassical states including the squeezed state, cat state, and entangled state in different parameter regimes. In this paper, we first use the polaron picture with high precision and fidelity to figure out the process of the superradiant phase transition (SPT) in view of the nonclassical states. The squeezing effect is considered to be a result of the higher-order excitations and important in order to understand the fundamental quantum physics of the SPT in the QRM. According to the polaron wave functions, the squeezed state extends across the entire range of parameters. Based on the squeezing and superradiance, a classification of the coupling strength for the nonclassical states containing the ground state is presented; the system sequentially goes through the vacuum states, the squeezed vacuum states, the squeezed cat states, and the cat states as the coupling strength increases. The process of the SPT is also demonstrated by the photon number distribution in Fock space, and then the novel behavior of parity chains for the SPT is revealed. Additionally, the nonclassical states can be intuitively characterized by the Wigner functions with analytical expressions in the polaron picture, and the Wigner negativity is evaluated to measure the nonclassicality. We find that a small but nonzero weighted antipolaron is necessary to form novel semicat states. Our paper provides guidance for preparing nonclassical states in experiments based on the light-matter interaction.			
62	Zi-Jian Xu and Jun-Hong An	Noise mitigation in quantum teleportation	Physical Review A	安钧鸿
摘要	Permitting the transmission of unknown quantum states over long distances by using entanglement, quantum teleportation serves as an important building block for many quantum technologies. However, in the noisy intermediate-scale quantum era, the practical realization of quantum teleportation is inevitably challenged by the noise-induced decoherence. We here propose a noise-mitigation mechanism applicable in both the discrete- and continuous-variable quantum teleportation schemes. Via investigating the non-Markovian decoherence dynamics of the two types of quantum teleportation schemes, we find that, as long as a bound state is formed in the energy spectrum of the total system consisting of the involved subsystems and their respective reservoirs, the quantum superiority of the fidelity is persistently recovered. Supplying an insightful understanding of the noise-mitigation protocols, our result paves the way to the practical realization of noise-tolerant quantum teleportation.			
63	Liu, Zhi-Qiang; Liu, Jie; Tan, Lei; Liu, Wu-Ming	Twice-enhanced quantum entanglement in a dual-coupled auxiliary-sphere-assisted cavity magnomechanical system	PHYSICAL REVIEW A	谭磊
摘要	We propose a mechanism to significantly enhance the photon-phonon entanglement twice by coupling an auxiliary magnetic sphere to a standard cavity magnomechanical system. The deformed sphere acts as a cold reservoir that can simultaneously cool two hybrid modes superposed over the optical cavity and the mechanical oscillator by modulating the relationship between the coupling strengths, which enables us to obtain large steady-state cavity-oscillator entanglement. On the basis of the double-mode cooling effect, the steady-state photon-phonon entanglement can be significantly improved by opening the single-coupled auxiliary-sphereassisted channel due to the fact that the nonsuperposed optical mode can be efficiently cooled via the auxiliary sphere. More importantly, the photon-phonon entanglement can be significantly enhanced again by switching the dual-coupled auxiliary-sphere-assisted (DC-ASA) passage, where the auxiliary sphere serves as an additional cold bath to simultaneously cool both the nonsuperposed optical mode and the reservoir mode. Moreover, in the DC-ASA regime, the steady-state entanglement is more robust against the mechanical thermal noise. This DC-ASA scheme can be potentially applied to accelerate magnomechanical cooling and enhance magnomechanical squeezing.			
64	Gong, Zeyang; Liu, Fu; Guo, Xinhong; Jiang, Changjun	Observation of the out-of-plane orbital antidamping-like torque	Physical Chemistry Chemical Physics	蒋长军
摘要	The out-of-plane antidamping-like orbital torque fosters great hope for high-efficiency spintronic devices. Here we report experimentally the observation of out-of-plane antidamping-like torque that could be generated by z-polarized orbital current in ferromagnetic-metal/oxidized Cu (CuO_x) bilayers, which is presented unambiguously by the magnetic field angle dependence of the spin-torque ferromagnetic resonance signal. The CuO_x thickness dependence of the orbital torque ratios highlights that the interfacial effect would be responsible for the generation of orbital current. Besides that, the CuO_x thickness dependence of the damping parameter further proves the observation of antidamping-like torque. This result contributes to enriching the orbital-related theory of the generation mechanism of the orbital torque. The y- and z-polarized orbital current is observed in FM/CuO_x bilayers. The and all increase dramatically and then monotonically decrease, highlighting that the orbital current originates in the FM/CuO_x interface.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
65	Xingliang Wang, Guijuan Zhao, Xiurui Lv, Mingyang Zhao, Wanting Weia and Guipeng Liu	Effect of doping and defects on the electronic properties of MoS_2/WSe_2 bilayer heterostructure: a first-principles study	Physical Chemistry Chemical Physics	赵桂娟
摘要	This work studies the effect of Nb, Mo, Re dopant, and Se vacancy in WSe_2 on the electronic and optical properties of the MoS_2/WSe_2 bilayer heterostructure based on first-principles calculations. Our research shows that the MoS_2/WSe_2 bilayer heterostructure exhibits a type-II band alignment with a valence band offset (VBO) of 1.07 eV and a conduction band offset (CBO) of 1.00 eV. It also shows that different dopants or defects can considerably modulate the energy band alignment and interlayer charge transfer of the heterostructure. Owing to the orbital hybridization of the dopant atoms with other atoms and the consequent enhancement of the coupling between the two structural layers, a transition of the band alignment from type-II to type-I is realized with the Re dopant. The effect of doping and defects on the electronic properties of heterojunctions contributes to applications in high-performance optoelectronic devices.			
66	Bo Zhang, Yu Zhang, Keliu Luo, Yonghai Guo, Ze Yan, Wenbo Lv, Bo Wang, Zhide Li, Ziyang Hu, Qi Wang, Jiangwei Cao	Implementation of Logic Function and Memristive Behavior in Synthetic Antiferromagnet with Strong Immunity to Perpendicular Magnetic Field Interference	Physica Status Solidi (RRL) – Rapid Research Letters	曹江伟
摘要	Spintronic devices with heavy metal/ferromagnet structures have shown potential applications for in-memory computing. However, the sensitivity of ferromagnet to external magnetic field raises a challenge for the practical applications of these devices. The usage of synthetic antiferromagnet (SAF) can effectively address this issue due to its good magnetic field immunity. This work demonstrates the implementation of all 16 types of Boolean logic functions via controlling the magnetization states of the SAF layer by using current pulses, and also the stable multistate storage under the interference of perpendicular magnetic field in these devices. The SAF devices also exhibit synaptic plasticity under the stimulation of current pulses. The artificial neural network constructed based on the SAF device can perform handwritten digit recognition tasks with an accuracy rate of 90%. These results showcase the viability and superiority of the SAF device in building logic-in-memory architecture for its strong immunity to magnetic field interference.			
67	1. Jinbo Lin, Guijuan Zhao, Ziwei Zhou, Xiacong Liu, Xingliang Wang, Wanting Wei, Zhiyuan Hao, Yuhang Wang and Guipeng Liu*	Theoretical Study of Enhancing the Performance of InP/InGaAs Avalanche Photodiodes with p-Type-Doped InP Interposed Layer	physica status solidi (RRL) - Rapid Research Letters	刘贵鹏
摘要	For InP/InGaAs avalanche photodiodes (APD), there are three important performance parameters: mean gain, excess noise factor, and dark current. Reducing excess noise and dark current is an effective way to achieve higher sensitivity and improve the performance of an APD. In this article, an interposed layer is introduced into the InP/InGaAs avalanche photodiode structure. The results considering dead space indicate that the thin interposed layer structure has lower excess noise factor and dark current at the same mean < G >compared with conventional APD structure, which is reduced by ≈34% and 11%, respectively, at mean gain < G > = 10. This provides a feasible idea for the construction of high-performance APD.			
68	Zhi-Qiang Liu, Lei Liu, Zhuang-ZHuang Meng, Lei Tan, Wu-Ming Liu	Simultaneously enhanced magnomechanical cooling and entanglement assisted by an auxiliary microwave cavity	OPTICS EXPRESS	谭磊
摘要	We propose a mechanism to simultaneously enhance quantum cooling and entanglement via coupling an auxiliary microwave cavity to a magnomechanical cavity. The auxiliary cavity acts as a dissipative cold reservoir that can efficiently cool multiple localized modes in the primary system via beam-splitter interactions, which enables us to obtain strong quantum cooling and entanglement. We analyze the stability of the system and determine the optimal parameter regime for cooling and entanglement under the auxiliary-microwave-cavity-assisted (AMCA) scheme. The maximum cooling enhancement rate of the magnon mode can reach 98.53%, which clearly reveals that the magnomechanical cooling is significantly improved in the presence of the AMCA. More importantly, the dual -mode entanglement of the system can also be significantly enhanced by AMCA in the full parameter region, where the initial magnon-phonon entanglement can be maximally enhanced by a factor of about 11. Another important result of the AMCA is that it also increases the robustness of the entanglement against temperature. Our approach provides a promising platform for the experimental realization of entanglement and quantum information processing based on cavity magnomechanics.			

序号	所有作者	题目	期刊名（Source Title）	联系人
69	Lei, Yutian; Yin, Mengying; Shi, Chang; Wu, Lingxi; Peng, Guoqiang; Xu, Youkui; Wang, Haoxu; Tang, Rongbing; Li, ZhenHua; Jin, Zhiwen	Tailored molecular for ultra-stability and biocompatible pseudohalide metal-free perovskite towards X-ray detectors with record sensitivity	NPJ Flexible Electronics	靳志文
摘要	The emerging pseudohalide metal-free perovskite (pseudohalide-MFPs) X-ray detector caters to the demands of timely mobile diagnosis owing to its lightweight, flexibility, and cost-effectiveness. However, the performance of these devices is severely limited by poor X-ray absorption, ultra-wide band gap, relative instability, and their unknown biotoxicity. Herein, we construct heavy atom covalent bonds (C-Br/Cl) on the A-site organic cation to reinforce component coordination to modulate X-ray absorption and band gap in pseudohalide-MFPs and further enhance its stability. Molecular dynamics simulations demonstrate that the introduction of halogen atoms can strengthen hydrogen bonding interactions, thereby improving the coordination between different components. The resultant (MDABCOBr)-$NH_4(BF_4)_3$ (MDABCO = N-methyl-N'-diazabicyclo[2.2.2]octonium) single crystal significantly increases X-ray absorption cross-section and crystalline density (from 1.728 to 1.950 g cm^{-3}), and synergistically realizes the band nature modulation (from 7.4 to 5.5 eV) and enhanced ionic migration inhibition (628 meV) with optimized stability. As such, our X-ray detectors realized a sensitivity of 2377 μC Gy_{air}^{-1} cm^{-2}, an ultralow detection limit of 50.1 nGy_{air} s^{-1}, and impressive operation stability. Moreover, cytotoxicity assay confirmed the compatibility of pseudohalide metal-free perovskite. Finally, within this framework, we successfully fabricate the (MDABCOBr)-$NH_4(BF_4)_3$-based flexible device to create an ideal in vitro wearable X-ray detection.			
70	Yuhan Chang, Ruoshui Wang, Yonglong Ga, Baoshan Cui, Hongfei Xie, Xu Zhang, Jianrong Zhang, Ze Yan, Yang Cao, Xi Guo, Hengyi Xu, Yalu Zuo, Chenglong Jia, Hongxin Yang * , Desheng Xue and Li Xi	Spin-fluctuation-induced sign reversal of the spin Hall angle in $Pt_{100-x}Co_x$ alloys near the Curie temperature	New Journal of Physics	席力
摘要	The spin Hall effect (SHE), typically emerging in non-magnetic metals with strong spin-orbit couplings, has attracted significant attention for its ability to convert a charge current into a spin current, a key feature in power-efficient spintronic devices. Recently, an enhanced SHE has been detected in the magnetic alloys, where the spin Hall conductivity is strongly modified by the dynamical and thermal spin fluctuations. We find that the spin Hall angle (θ_{SH}) in $Pt_{100-x}Co_x$ alloys dramatically changes at the Curie temperature, which is positive in the paramagnetic phase akin to Pt, while negative in the ferromagnetic phase. Such intriguing behavior of θ_{SH} stemming from individual and collective fluctuations in the magnetic moments is further substantiated with the full-fledged Monte Carlo simulations. Our work broadens insights into the SHE and highlights the importance of spin fluctuations for the spin-current generation near the ferromagnetic instability point of magnetic alloys.			
71	ZhenHua Li,YuRong Zeng,YongXi Cheng,Xiao Zheng,JianHua Wei,Hong-Gang Luo and YiJing Yan	The Kondo scaling for spin thermocurrent in strongly correlated electron systems	NEW JOURNAL OF PHYSICS	李振华
摘要	One of the most important feature in the Kondo physics is the universal scaling behavior. In this study, we analyze the transport behavior of the spin thermocurrent driven by a small temperature bias and under a weak magnetic field. We conclude that the spin thermocurrent exhibits a universal scaling behavior, similar to the spin susceptibility. The validity of our conclusion is also checked by using the numerically exact hierarchical equations of motion approach. From our fitting result of the scaling function, it is found that the Kondo temperature can be determined by the maximum of the spin thermocurrent at $T / T_K = 0.383$.			
72	Wei-Wei Yang, Hong-Gang Luo and Yin Zhong	Shubnikov–de Haas effect in the Falicov–Kimball model: strong correlation meets quantum oscillation	New Journal of Physics	钟寅
摘要	We present a comprehensive investigation of quantum oscillations (QOs) in the strongly-correlated Falicov-Kimball model (FKM). The FKM is a particularly suitable platform for probing the non-Fermi liquid (NFL) state devoid of quasiparticles, affording exact Monte Carlo simulation across all parameter spaces. In the high-correlation regime, we report the presence of prominent QOs in magnetoresistance and electron density at low temperatures within the phase separation state. The frequency behavior of these oscillations uncovers a transition in the Fermi surface as electron density diminishes, switching from hole-like to electron-like. Both types of Fermi surfaces are found to conform to the Onsager relation, establishing a connection between QOs frequency and Fermi surface area. Upon exploring the temperature dependence of QOs amplitude, we discern a strong alignment with the Lifshitz-Kosevich (LK) theory, provided the effective mass is suitably renormalized. Notwithstanding, the substantial enhancement of the overall effective mass results in a notable suppression of the QOs amplitude within the examined temperature scope, a finding inconsistent with Fermi liquid predictions. For the most part, the effective mass diminishes as the temperature increases, but an unusual increase is observed at the proximity of the second-order phase transition instigated by thermal effects. As the transition ensues, the regular QOs disappear, replaced by irregular ones in the NFL state under a high magnetic field. We also uncover significant QOs in the insulating charge density wave state under weak interactions (0< U <1), a phenomenon we elucidate through analytical calculations. Our findings shed light on the critical role of quasiparticles in the manifestation of QOs, enabling further understanding of their function in this context.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
73	Tong Li , Dezheng Yang, Xiaowei Jin, Li Xi and Desheng Xue	New characteristic parameter of energy loss in permalloy	New journal of physics	薛德胜
摘要	Characteristic parameters of energy storage and loss in soft magnetic materials (SMMs), product S of initial susceptibility χ_i and resonance frequency ω_r and product L of maximum χ''_m and half width $\Delta\omega$ of imaginary part, were introduced in permalloy films. Expressions of characteristic parameters were derived from Landau-Lifshits-Gilbert equation with a general anisotropic free energy model. It was found S = L equals to intrinsic quantity of SMMs $Q=\gamma Ms\sqrt{1+H_{\perp}/H_{//}}$, where γ is the gyromagnetic ratio, M_s is the saturation magnetization, and $H_{\perp}$ to and $H_{//}$ are mutually orthogonal effective magnetic fields. In the presence of eddy current, it was found S remains equal to Q while L < Q results from inhomogeneity of microwave magnetic field caused by eddy current. Moreover, a linear scale of **L/S** versus Gilbert damping factor alpha was found in permalloy films with different thicknesses. Hence, our findings provide a new perspective on energy storage and loss of SMMs.			
74	Zhen-Lin Jia, Shu-Chen Wang, Tong Li, Xiao-Wei Jin and De-Sheng Xue	Large-angle analytical solution of magnetization precession in ferromagnetic resonance	New journal of physics	薛德胜
摘要	Dynamics of magnetization **M** driven by microwave are derived analytically from the nonlinear Landau-Lifshitz-Gilbert equation. Analytical **M** and susceptibility are obtained self-consistently under a positive circularly polarized microwave field, h=(h cosωt,h sinωt,0), with frequency ω, which is perpendicular to a static field, **H**=(0,0,H). It is found that the orbital of M is always a cone along **H**. However, with increasing h the polar angle θ of **M** initially increases, then keeps 90° when $h>=h_0=\alpha\omega/\gamma$ in ferromagnetic resonance (FMR) mode, where alpha is Gilbert damping constant and gamma is gyromagnetic ratio. These effects result in a nonlinear variation of FMR signal as h increases to $h >= h_0$, where the maximum of resonance peak decreases from a steady value, linewidth increases from a decreasing trend. These analytical solutions provide a complete picture of the dynamics of **M** with different **h** and **H**.			
75	Yue Cai, Kang-Jie Ma, Jie Liu, Gang-Feng Guo, Lei Tan, and Wu-Ming Liu	Highly scalable quantum router with frequency-independent scattering spectra	New Journal of Physics	谭磊
摘要	Optical quantum routers play a crucial role in quantum networks and have been extensivelystudied in both theory and experiment, leading to significant advancements in their performance.However, these routers impose stringent requirements for achieving desired routing results, as theincident photon frequency must be in strict resonance with one or several specific frequencies. Toaddress this challenge, we propose an efficient quantum router scheme composed of semi-infinitecoupled-resonator waveguide (CRW) and a giant atom. The single-channel router scheme enablesstable output with 100% transfer rate over the entire energy band of the CRW. Leveraging thisintriguing result, we further propose a multi-channel router scheme that possesses high stability and universality, while also being capable of performing various functionalities. The completephysical explanation of the underlying mechanism for this intriguing result is also presented. Wehope that quantum router with output results unaffected by the frequency of the incominginformation carriers presents a more reliable solution for the implementation of quantum networks.			
76	Qiankun Qin, Afei Ding, WL Qubie, Pushpendra Kumar, Shixin Hu, Tianyang Yao, Junli Zhang	Microstructure parameter-dependent non-collinear magnetic structures in scandium-doped M-type hexaferrite nanocrystals	NANOSCALE	张俊丽
摘要	The quest for materials with non-collinear magnetic structures has been driven by their unique properties and potential applications in advanced spintronics and data storage technologies. In this study, we investigate the induction of a non-collinear conical state in $BaFe_{12}O_{19}$ (M-type) nanocrystal fibers through the substitution of Fe^{3+} ions with diamagnetic Sc^{3+} ions. This substitution introduces an additional parameter for tuning the magnetic structure and allows precise control over the substitution amount. We demonstrate that the non-collinear conical state remains stable within a temperature range of 125 K to 325 K and can be finely adjusted by varying the Sc^{3+} substitution amount. The selective occupancy of Sc^{3+} ions at the 2a, $4f_2$, and 2b sites within the M-type ferrite lattice weakens the super-exchange interaction between Fe1, Fe2, and Fe5 ions. This weakening disrupts interactions between different blocks S/R (R*/S*) and stabilizes the conical state. These findings highlight a significant approach to modulating non-collinear magnetic structures in hexagonal ferrites, with implications for both fundamental research and practical applications in the development of novel magnetic materials. The selective occupancy of Sc^{3+} ions at the different Fe^{3+} sites within the M-type ferrite weakens the super-exchange interaction between Fe1, Fe2, and Fe5 ions, which disrupts interactions between different blocks and stabilizes the conical state.			

序号	所有作者	题目	期刊名（Source Title）	联系人
77	Xiaofeng Zhang, Muhammad Sufyan Javed, Salamat Ali, Awais Ahmad, Syed Shoaib Ahmad Shah, Iftikhar Hussain, Dongwhi Choi, Ammar M. Tighezza,Elsayed Tag-Eldin, Changlei Xia, Shafaqat Ali, Weihua Han,	Band engineering in $Ti_2N/Ti_3C_2T_x$-MXene interface to enhance the performance of aqueous NH_4^+-ion hybrid supercapacitors	Nano Energy	韩卫华
摘要	The aqueous hybrid supercapacitor (AHSC) based on ammonium ion (NH^{4+}) is an interesting energy storage device with excellent properties. However, the scarcity of appropriate and effective cathode materials limited its practicality. Two-dimensional (2D) transition metal nitrides, carbides, or carbonitrides (MXenes) show potential as cathode materials, but their low capacitance limits their applicability. Here, we synthesized N-functionalized 2D MXene ($Ti_3C_2T_x$) with Ti_2N interface engineering ($Ti_2N/Ti_3C_2T_x$), which displayed not only superior capacitance and rate capability but also a cycling stability than pristine $Ti_3C_2T_x$. Ex-situ XRD and XPS were used to study the charge storage mechanism at the interface of $Ti_2N/Ti_3C_2T_x$. Furthermore, density functional theory (DFT) calculations were employed to validate the superior conductivity at the interface of the $Ti_2N/Ti_3C_2T_x$ (T_x = OH) electrode. Moreover, AHSC was assembled with the $Ti_2N/Ti_3C_2T_x$ as cathode, and activated carbon as anode possesses outstanding energy storage performance. This study not only elucidates the charge storage process of $Ti_2N/Ti_3C_2T_x$ but also provides new insights for designing novel cathode materials for energy storage devices.			
78	Xu, Youkui; Li, Zhenhua; Yu, Tengfei; Peng, Guoqiang; Lei, Yutian; Chen, Huanyu; Wu, Yujiang; Wang, Haoxu; Jin, Zhiwen	Crystalline-Amorphous Heterojunction for a Metal Halides Single Crystals X-Ray Detector with Substantially Increased Sensitivity	LASER & PHOTONICS REVIEWS	靳志文
摘要	Ion migration-induced noise is the main limiting factor for metal halides (MHs) single crystals (SCs) X-ray detectors, and heterostructure design is the most efficient method to overcome this puzzle. However, the conventional stepwise solution method or heteroepitaxial method is greatly limited by the SCs secondary dissolution and the lattice parameters matching. Here, simple and universal crystalline-amorphous heterojunction is developed that proves to be extremely effective in suppressing noise. $MAPbBr_3$ SCs are first chosen as representatives to form heterojunctions with amorphous MTP_2MnBr_4 by the melting method, and the related device shows an enhanced X-ray response with significant noise suppression. Computational and experimental results demonstrate that the gradient energy levels formation and improved ion migration energy are responsible for this. Finally, the optimized device shows a low dark current (reduced from≈1000 to≈0.12 nA), ultra-high sensitivity (10 569 μC Gy_{air}^{-1} cm^{-2}), lower detection limit (82.64 nGy_{air} s^{-1}), and negligible performance deterioration at a total radiation dose of approximate to 17 000 mG_{yair}. Moreover, six other SCs are selected to verify the universal effect of the heterojunctions, all of which show excellent improved sensitivity, proving its versatility. Hence, it is believed that this work will give a strong impetus to develop sensitive MHs SCs X-ray detectors. A crystalline-amorphous heterojunction preparation method is developed for noise suppression in single crystals (SCs) X-ray detectors. $MAPbBr_3$ as represented, the optimized device dark current is reduced from approximate to 1000 to approximate to 0.12 nA, exhibiting excellent X-ray detection performance. Further, six other SCs are selected to verify the generality of this approach, all exhibiting much-enhanced sensitivity.image			
79	Xudong Zhou; Li Chen;Hongtao Liao;Yongheng Jiang; Huifu Xiao; Jianhong Yang; Mingrui Yuan;Yu He;Yong Zhang;Yikai Su;Yonghui Tian	Integrated Arbitrary Multimode TM-Pass Polarizer Based on Anisotropic Optical Manipulation	LASER & PHOTONICS REVIEWS	田永辉
摘要	On-chip optical polarizer can extract the desired polarized light signal while filtering out the other polarized light signal, which plays a key role in integrated photonic circuits for purifying the desired polarized signal and reducing polarization crosstalk. However, most of the reported optical polarizers can only work for fundamental modes. With the rapid development of on-chip multimode processing systems, arbitrary high-order mode optical polarizers are more desirable. In this contribution, a TM-pass optical multimode polarizer is proposed and demonstrated using subwavelength grating-based anisotropic manipulation, which can achieve the polarizing of arbitrary TM high-order mode theoretically, and the experimental results show the lowest polarization extinction ratio of the fabricated device can reach up to 21.2 dB under working for four-mode (TM_0, TM_1, TM_2, and TM_3) system. The dynamic data transmission with the data rate of 64 Gbit s^{-1} has also been demonstrated to verify its potential for systematized applications in the future. In this paper, a TM-pass optical multimode polarizer is proposed and demonstrated using subwavelength grating-based anisotropic manipulation, which can achieve the polarizing of arbitrary TM high-order mode theoretically, and the experimental results show the lowest polarization extinction ratio of the fabricated device can reach up to 21.2 dB under working for four-mode (TM_0, TM_1, TM_2, TM_3) system. image			

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序号	所有作者	题目	期刊名（Source Title）	联系人
80	HongtaoLiao；LiChen；XudongZhou；SiyuanGuo；YonghengJiang；HuifuXiao；MeiXianLow；ThachGiangNguyen；AndreasBoes；GuanghuiRen；ArnanMitchell；YonghuiTian	Photonic Metamaterial-Inspired Polarization Manipulating Devices on Etchless Thin Film Lithium Niobate Platform	LASER & PHOTONICS REVIEWS	田永辉
摘要	Photonic metamaterials interact with light at the micro-nano scale, enabling unprecedented optical manipulation capabilities, which play a key role in nonlinear optics, spin optics, negative index, and zero index materials. Recently, thin-film lithium niobate on insulator (LNOI) has emerged as a promising platform for integrated photonics due to its unique material properties, including an excellent electro-optic effect, wide transparency window, and low waveguide losses. Metamaterial structures are promising for constructing novel integrated photonic circuit building blocks on LNOI as they can provide advantageous circuit functionality. In this work, as a proof of concept, high-performance polarization manipulating devices including polarization splitter rotator (PSR), polarization rotator (PR), and polarizer are demonstrated using photonic metamaterials on the etchless LNOI platform by introducing a silicon nitride layer on the top of LNOI wafer as the loading material. In this way, full advantage of lithium niobate (LN) can be taken to achieve various high-performance integrated photonic devices, while avoiding the etching of LN and simplifying the fabrication process greatly, which can bring bright prospects for achieving large-scale lithium niobate integrated photonic circuits.			
81	LiHeng Wang；Zhen Han；Yong Zheng；Pu Zhang；YongHeng Jiang；HuiFu Xiao；BinJie Wang；Mei Xian Low；Aditya Dubey；Thach Giang Nguyen；Andreas Boes；Guanghui Ren；Ming Li；Arnan Mitchell；Yonghui Tian	Integrated Ultra-Wideband Dynamic Microwave Frequency Identification System in Lithium Niobate on Insulator	LASER & PHOTONICS REVIEWS	田永辉
摘要	The capability to identify the frequency of unknown microwave signals with an ultra-wide measurement bandwidth is highly desirable in radar astronomy, satellite communication, and 6G networks. Compared to electronic solutions, the integrated photonic technology-enabled dynamic instantaneous frequency measurement (DIFM) approach is attractive as it offers unique advantages, such as ultra-wide frequency measurement bandwidth, high flexibility, and immunity to electromagnetic interference. However, so far the bandwidth of the reported DIFM systems based on integrated photonic technology is limited to below 30 GHz due to the finite bandwidth of electro-optical modulators (EOMs), limiting their applications, particularly in the field of millimeter wave technology (30-300 GHz). Here, the first integrated dynamic microwave instantaneous frequency measurement system with a record-breaking operation bandwidth (ranging from 5 to 65 GHz) and low root-mean-square (RMS) error (≈300 MHz) is presented on the lithium niobate on insulator (LNOI) integrated photonic platform. This demonstration paves the way for high-performance millimeter wave photonic integrated devices using the LNOI platform. An integrated dynamic microwave instantaneous frequency measurement system with a record-breaking operation bandwidth (ranging from 5 to 65 GHz) and low root-mean-square (RMS) error (similar to 300 MHz) is proposed and experimentally demonstrated on lithium niobate on an insulator (LNOI) platform. This work paves a solid path for developing high-performance millimeter wave photonic devices on the LNOI platform. image			
82	Hu, Xiaoliang Hao, Rui Luo, Lili Zhang, Youwei Li, Yingtao Zhang, Zemin	Neuromorphic Computing Using a Floating Gate Modulated Photoelectric Synaptic Transistor	Laser & Photonics Review	张泽民
摘要	Confronting the limitations of traditional von Neumann architectures-chiefly their inability to process unstructured data efficiently, this work proposes a new in-memory sensing and computing paradigm exemplified by introducing a pioneering tin oxide nanowire-based photoelectric synaptic transistor (PST) with a floating gate replicating biological synapses' functionality. Capitalizing on the nanowire structure's high surface area to volume ratio, the PST overcomes the challenges of photo response in metal oxide semiconductors. Integrating metal oxides' Photoelectric-Phenomenon-Coupling effect with the charge storage capacity of field-effect transistors enables effective optical detection and weight storage. The PST performs exceptional optoelectrical and synaptic properties, including capabilities for long-term memory, short-term memory, paired-pulse facilitate, and synaptic plasticity. Furthermore, by incorporating a learning mechanism, the PST achieves an impressive 94.65% accuracy in recognizing patterns in the Modified National Institute of Standards and Technology's(MNIST) handwritten digit dataset within 50 epochs. This research indicates a significant step toward intelligent computing systems closely mimicking the human brain's computational prowess. This work introduces a tin oxide nanowire-based photoelectric synaptic transistor with a floating gate, emulating biological synapses to overcome traditional von Neumann architecture limitations. The PST combines metal oxides' photoelectric effects with FET charge storage, achieving considerable accuracy in MNIST digit recognition, and advancing intelligent computing. image			

序号	所有作者	题目	期刊名（Source Title）	联系人
83	Bo Zhang, Jijun Xue, Yantao Cao, Qifeng Kuang, Da Li, Hanjie Guo, ZhenHua Li, Liyun Tang, Hua Pang, Fashen Li, Zhiwei Li	Site preference of the 3d transition metal ions in the $Mn_{4-x}Fe_xNb_2O_9$ compounds as revealed by Mössbauer spectroscopy	Journal of Magnetism and Magnetic Materials	李志伟
摘要	In this paper, we report on structural, magnetic, Mossbauer spectroscopy and density functional theory (DFT) studies of the $Mn_{4-x}Fe_xNb_2O_9$ compounds. Temperature dependent magnetization measurements have shown that the paramagnetic to antiferromagnetic transition temperatures, T_N, depend non-linearly on the Fe doping level x, which is different from earlier studies on similar compounds of $Mn_{4-x}Co_xNb_2O_9$. More interestingly, our Mossbauer spectroscopy measurements have revealed preferential occupation of the 3d transition metal ions, namely, the Fe(Mn) atoms prefer to occupy the highly buckled M-II(relative flat M -I) site, which can be well understood by the band mixing behavior from our DFT calculations. These results are expected to be important for a better understanding of the rich physics of this family of compounds, especially when one concerns the interpretation of experimental results of similar mixing compounds.			
84	Jie Xu，Fu Liu，Yibing Zhao，Ying Jin，Bokai Liang，Changjun Jiang	Microwave magnetic properties of twisting structure in artificial ferrimagnet Py/Gd multilayers	Journal of Magnetism and Magnetic Materials	蒋长军
摘要	The noncollinear magnetic structure is attracting significant attention owing to its abundant characteristics as well as its potential applications in spintronic devices. In this work, the magnetic characteristics for an artificial ferrimagnetic Py/Gd multilayer system having the magnetic twisted state were investigated. With an increasing thickness (1.4 to 4 nm) of the Gd layer (t_{Gd}), the effective magnetization decreased initially until t_{Gd} = 2.5 nm and then increased, which was found to be induced by the change of magnetic twisted state due to antiferromagnetic coupling between Py and Gd. Moreover, the effective Gilbert damping factor was found to be completely opposite to the effective magnetization with increasing t_{Gd}. Our results provided detailed insights into the microwave magnetic properties of an artificial ferrimagnet with a noncollinear magnetic structure that provides alternative material in the application of spintronic devices			
85	Xinyu Liu , Fu Liu , Changjun Jiang	Harnessing orbital Hall effect for efficient orbital torque in light metal vanadium	Journal of Magnetism and Magnetic Materials	蒋长军
摘要	The orbital Hall effect depicts the conversion of charge current to orbital current in nonmagnetic materials without spin-orbit coupling. This absence of spin-orbit coupling enables the light metals serve as sources of orbital current exploited as the information carrier to be applied to the information technology. Here, we investigate current-induced torques in vanadium/ferromagnet (V/FM, FM = Fe, Co, $Ni_{81}Fe_{19}$) bilayers via spintorque ferromagnetic resonance (ST-FMR) system. The sign reversal confirms that the orbital Hall effect exists in light metal V, and the orbital torque in V/Co and V/$Ni_{81}Fe_{19}$ bilayers is dominant. By performing the V thickness dependence of conversion efficiency, we determined the orbital diffusion length of 3.61 nm for V. Our experiment demonstrates that light metals can be used as novel materials in spin-orbit devices, and our research focuses on the orbital freedom of the electron and provides new content for the study of orbital dynamics.			
86	Yibing Zhao, Fufu Liu, Ying Jin, Bokai Liang, Changjun Jiang	Unraveling the negative charge-to-spin conversion in the Heusler alloy Co_2FeSi	JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS	蒋长军
摘要	Recent discoveries of Heusler alloy achieve a strong advantage of the chemically disordered sample in the charge-to-spin conversion and attracted interests for spintronics applications. Here, we observe the negative charge-to-spin conversion in single magnetic layer of Co_2FeSi/MgO and prove generations of $\boldsymbol{\sigma}_y$ and $\boldsymbol{\sigma}_x$ by spintorque ferromagnetic resonance (ST-FMR). We also report that the change in charge-to-spin conversion efficiency could be controlled by chemical disordering. Furthermore, the thickness dependents of Co_2FeSi demonstrated bulk effect is responsible for the generation of spin current. This study contributes to understanding the mechanisms of spin current generation from magnetic full Heusler alloy and also paves the way for the applications of magnetic memory and nonvolatile spin logic technologies.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
87	Shixin Hu , Bo Zhang , Jijun Xue , Hua Pang	Lattice dynamics and enhanced electron–phonon coupling of itinerant magnet $Fe_{1-x}Co_xSi$ ($x \geq 0.3$): A ^{57}Fe Mössbauer spectroscopy study	Journal of Magnetism and Magnetic Materials	庞华
摘要	The magnetic phase transition in itinerant magnets involves many fundamental physical problems. Here we report a systematic investigation on the ^{57}Fe Mössbauer spectroscopy of B20-type $Fe_{1-x}Co_xSi$ ($0.3 \leq x \leq 0.8$) compounds in combination with macroscopic magnetism and resistance measurements. We observed non-Fermi liquid behavior at low temperatures in the region of phase transition (close to x = 0.7), as well as significant phonon softening. In addition, with the increase of Co content, the effect of electron-phonon coupling on the hyperfine field is gradually comparable to that of spin fluctuations. Our observations indicate that electron doping promotes electron-electron correlations and facilitates electron-phonon interactions at the cost of suppression of magnetic ordering and magnetic fluctuations, suggesting that interactions between phonons and other quasiparticles play a crucial role in the magnetic phase transitions of itinerant helical magnets.			
88	Wentao Ji , Shixin Hu , Xiaoying Wang , Jijun Xue , Hua Pang	Temperature-dependent evolution of micromagnetic structure of B20-type $Fe_{1-x}Co_xGe$ studied by Mossbauer spectroscopy	Journal of Magnetism and Magnetic Materials	庞华
摘要	The non-collinear magnetic structures hosted in magnets with broken central inversion symmetry, some of which are topologically non-trivial, have unique physical properties and application prospects. This paper presents a detailed study of the temperature evolution of the micromagnetic structures of B20-type $Fe_{1-x}Co_xGe$ (x = 0, 0.05, 0.10) polycrystalline samples using ^{57}Fe Mossbauer spectroscopy. We take the relatively weak electric quadrupole interaction as a perturbation of the hyperfine magnetic interaction to obtain the distribution of the hyperfine magnetic field $\boldsymbol{H}_{hf}(\varphi)$ in the plane perpendicular to the magnetic propagation vector ks. It is found that the geometric features of $\boldsymbol{H}_{hf}(\varphi)$ are sensitive to the relative orientation of ks regarding the electric field gradient at the iron nucleus, as well as to the spin texture. The temperature dependence of $\boldsymbol{H}_{hf}(\varphi)$ provides a distinct signal of first-order phase transition when ks shifts from [100] to [1 1 1]. The doping of cobalt atoms leads to out-of-plane component and in-plane component aggregation of the neighboring iron magnetic moments. These results are instructive for understanding the dynamical behavior of spiral magnets with long-periods.			
89	Xiaofeng Pu, Qianyang Zhou, Guozhi Chai, Daqiang Gao*	Optimization of U-shaped Cu@ $Fe_{20}Ni_{80}$ core for orthogonal fluxgate sensor	Journal of Magnetism and Magnetic Materials	高大强
摘要	Magnetic fluxgate sensors require composite ferromagnetic probes with excellent noise performance. An electrochemical deposition method was employed to deposit various thicknesses of permalloy ($Fe_{20}Ni_{80}$) onto copper wires with varying diameters. The magnetic properties of the composite structural filaments were then characterized. A U-shaped magnetic core structure was created for application in an orthogonal fluxgate sensor. Through noise testing in fundamental mode, we determined the optimal diameters and thicknesses of copper and permalloy. By analyzing the magnetization mechanism, probe sensitivity, and noise value at 1 Hz in response to changes in the excitation signal, we established that a probe consisting of a 100 μm Cu core and 12 μm $Fe_{20}Ni_{80}$ coating [Cu(100)-FeNi(12)] demonstrated the optimal noise performance at 1 Hz, with a figure of merit of 59 pT/√Hz. The proposed structure meets the requirements of most practical applications. The results can serve as a valuable reference for the fabrication of subsequent composite structure wire magnetic sensor probes.			
90	Xi Tan a, Dandan Huang a, Mingyang Zhao a, Weining Liu a, Qionglin Cheng a, Yaqian Ren a, Ming Yi a, Qi Ding a, Yuzhe Song b, Mingling Xie b, Chaoxin Yun b, Zhichao Liang c, Hairong Li a,*	GMR detection of magnetic beads with different sizes	Journal of Magnetism and Magnetic Materials	李海蓉
摘要	In recent years, there has been a growing body of research concerning the detection of biomolecules using giant magnetoresistance (GMR) sensors in conjunction with magnetic beads. Researchers have primarily focused on enhancing detection accuracy through various means, including increasing the sensitivity of the sensor itself and refining the signal detection scheme. In this paper, we investigated the impact of magnetic bead particle size on the GMR sensor signal. We selected Fe_3O_4 magnetic beads with varying particle sizes for analysis. We discuss their internal composition, grain structure, and magnetic properties. Employing microelectromechanical system (MEMS) technology, we fabricated a high-resistance GMR sensor with a resistance value of 298 kilohms. We then conducted magnetic bead signal detection on a custom-built platform. We also explored the optimal operating point for magnetic bead detection based on the magnetic response of the GMR sensor. Our findings demonstrate that enhancing the magnetic properties of the beads is crucial for improving detection, as larger bead sizes result in higher saturation magnetization and larger signal outputs from the GMR sensor.			

序号	所有作者	题目	期刊名（Source Title）	联系人
91	Xue Bai , Jianing Wang , Jinxia Yang , Qingfang Liu	Size and stability of skyrmion bags in ultrathin magnetic nanodots	Journal of Magnetism and Magnetic Materials	刘青芳
摘要	Size and stability of magnetic skyrmion bags in a cylindrical ultrathin nanodot under the influence of an applied magnetic field are investigated. Micromagnetic calculations reveal unique characteristics in the behavior of skyrmion bags across various materials. By adjusting the magnetic parameters of the materials, the stability of skyrmion bags can be significantly enhanced. We believe that our results will provide valuable insights for the experimental development of magnetic multilayers tailored for devices based on skyrmion bags.			
92	Huaidong Li , Yunxu Ma , Qingfang Liu	Pulsed magnetization reversal in Ni nanowire	Journal of Magnetism and Magnetic Materials	刘青芳
摘要	Pulsed magnetic field-induced magnetization reversal in Ni nanowires is investigated using micromagnetic simulation. The pulse amplitude, duration, and size of the nanowire are proven to have substantial impacts on the magnetization reversal process. Increasing pulse amplitude and duration leads to faster magnetization reversal for 10 nm-diameter nanowires. But for 40 nm-diameter nanowires with the same aspect ratio, the pulse parameters have a complicated influence on the magnetization reversal process due to the formation and propagation of magnetic domain walls. Further investigations reveal that applying a pulsed field at a certain angle from the long axis of the nanowire or raising the temperature can significantly accelerate the magnetization reversal process.			
93	Zhibiao Xu, Sha Zhang, Jinghao Cui, Donglin He, Ke Wang, Jingjing Zhao, Yu Liu, Tao Wang	High permeability and low loss easy-plane ferrites with multi-ions doped for miniaturized 5G antennas	Journal of Magetism and Magnetic Materials	王涛
摘要	Ferrites are the desirable candidates for antenna substrates due to their high permeability and low magnetic loss. However, such excellent magnetic properties cannot be maintained in the GHz band due to the Snoek limit. Here, we report a $BaCo_{1.8}Zn_{0.2}Fe_{16}O_{27}$ (CoZnW) ferrite prepared by doping multiple ions at the lattice (Zn ions) and grain boundaries (Bi/Ca/Si/V ions) of conventional $BaCo_2Fe_{16}O_{27}$ (Co_2W) ferrites, achieving a high permeability of 3.3, low magnetic loss tangent of 0.05, and a high figure of merit (FOM=μ'Qf = 66) at 1 GHz, which is much better compared to the previous reports. Moreover, the dimensions of the antenna deploying the multi-ions doped CoZnW are only 52 % of those deploying conventional commercial materials (Fr4) because of its high permeability and low loss. Such a high permeability is attributed to the enhanced saturation magnetization and the reduced anisotropic field achieved by Zn ions modulation. The low magnetic loss is attributed to the reduced damping of domain wall motion and the refined grain size achieved by Bi/Ca/Si/V ions modulation. Our work not only provides a promising candidate for 5G antennas but also uncovers a physical mechanism for the modulation of magnetic properties of ferrites.			
94	Yue Han, Guowu Wang, Zhibiao Xu, Ke Wang, Donglin He, Ying Wang, Tao Wang	Fe_4N soft magnetic composite with ultra-low eddy current loss and excess loss above megahertz	Journal of Magetism and Magnetic Materials	王涛
摘要	In this study, Fe_4N particles were synthesized from pure iron by gas nitridation and then fabricated into soft magnetic composite through silica-polyurethane insulation combined with warm compaction. The composite exhibits excellent soft magnetic properties in the several-megahertz frequency range. The complex permeability spectra of Fe_4N composite show a remarkable frequency stability, with the real part remaining nearly constant below 100 MHz. The resonance frequencies of domain wall motion mechanism and spin rotation mechanism are up to 481 MHz and 2.24 GHz, respectively, which are ten times higher than those of Fe composite. Due to the effective suppression of both eddy current loss and excess loss, the total core loss decreases to 725.6 kw/m^3 at 3000 kHz and 10 mT, exhibiting almost a linear growth with frequency. These outstanding properties are mainly due to the relatively large magnetocrystalline anisotropy and high resistivity of Fe_4N particles. In addition, Fe_4N composite also exhibits an excellent DC bias performance, maintaining over 98% permeability under a superimposed magnetic field of 100 Oe. This study presents an effective solution for suppressing eddy current and excess losses at high frequencies, offering potential for the application of power inductors in high-frequency scenarios.			
95	Donglin He, Liangrui Tan, Peng Wang, Zhibiao Xu, Qinglin Li, Tao Wang	Textured CoZn-18H hexaferrite with enhanced Snoek 's product and suppressed magnetic loss	Journal of Magetism and Magnetic Materials	王涛
摘要	Modern communications have created a great demand of magneto-dielectric functional materials having low loss and high permeability properties under the sub-6 GHz band. CoZn-18H planar hexagonal ferrites with strong magnetic anisotropy are more promising in meeting these requirements than that of traditional ferrites. The textured CoZn-18H hexagonal ferrites were synthesized by the reactive templated grain growth (RTGG) method to obtain high magnetic resonance frequency without sacrificing permeability. The layered texture composed of flaky hexagonal particles with a high aspect ratio played an important role in obtaining high permeability and high magnetic resonance frequency. The permeability μ', magnetic loss tangent tan delta mu, and performance factor (PF) of the textured CoZn-18H hexagonal ferrite with the highest Snoek's product (SP = 6.99 GHz) under 3.41 GHz were 1.66, 0.10, and 56.61 GHz, respectively. Compared with the traditional pure dielectric substrate, a planar inverted F antenna (PIFA) working at 3.0 GHz with a miniaturization rate of 18.1 % was simulated based on the textured CoZn-18H hexagonal ferrite. These results demonstrated that the method of preparing textured CoZn-18H hexagonal ferrites without the application of a magnetic field was effective and revealed the potential of textured planar hexagonal ferrites synthesized by the RTGG method of high-frequency and low-loss applications.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
96	Song, Yan; Cui, Si-Yuan; Wang, Yong-Qiang	Weak cosmic censorship with SU(2) gauge field and bound on charge-to-mass ratio	JOURNAL OF HIGH ENERGY PHYSICS	王永强
摘要	We numerically construct the stationary solutions of SU(2) Einstein-Yang-Mills theory in four dimensional anti-de Sitter spacetime. When the t component of the SU(2) gauge field is taken to the only nonzero component, we construct a class of counterexamples to the weak cosmic censorship conjecture in Einstein-Maxwell theory. However, including a nonzero ϕ component of SU(2) gauge field, we can argue that there is a minimum value q_W, when the charge carried by the ϕ component is larger than this minimum value, for sufficiently large boundary electric amplitude a, the original counterexamples can be removed and cosmic censorship is preserved.			
97	Ding, Peng-Bo; Ma, Tian-Xiang; Fang, Tie-Feng; Wang, Yong-Qiang	Study of boson stars with wormhole	JOURNAL OF HIGH ENERGY PHYSICS	王永强
摘要	In this paper, we study the mixed system of boson stars (BSs) with wormholes at their center. The boson star is obtained by employing a complex scalar field without self-interaction or a complex scalar field with quartic self-interaction and the wormhole is obtained by employing a phantom field. Utilizing the numerical method, we successfully obtain both symmetric and asymmetric solutions within the two asymptotically flat regions. The key focus of our study involves the systematic exploration of variations in results by varying the throat parameter η_0, and the parameter c, representing the quartic term in potential. In the ground state, we find the mass M and Noether charge Q versus the scalar field frequencies omega are multi-valued curves when the η_0 is small or the self-interaction is strong, the multi-valued curves will turn into single-valued curves as η_0 or c increases. Furthermore, we observe that asymmetric solutions can transition into symmetric solutions at specific scalar field frequencies ω for certain settings of η_0 and c. In addition, when it comes to the excited state, the properties of symmetric solutions remain akin to those in the ground state, while asymmetrical results display different characteristics from the ground state. We also present the wormhole spacetime geometry to investigate the properties of this model.			
98	Xiang, Qian; Zhao, Li; Fang, Tie-Feng; Wang, Yong-Qiang	A study on spontaneously translational symmetry breaking in the excited states of holographic superconductor	JOURNAL OF HIGH ENERGY PHYSICS	王永强
摘要	We revisit HHH model [1] and extend the ansatz of matter fields to being of depending on a spatial dimension except the holographic direction. Despite homogeneous solutions of ground and excited states, especially for the excited states, there also exists solutions where the translational invariance is broken. It is worth mentioning that no periodic sources are assigned to the matter fields, so the translational symmetry is broken spontaneously. We investigate how the new solutions and the condensates of excited states develop with the change of temperature. Moreover, since this kind of condensate will decrease at certain temperature and eventually vanish at sufficiently low temperature, we also study the relation between this interval and length of lattice. Besides, we compare the free energies of non-translational invariant solutions and those of translational invariance in the HHH model, and find that the free energies of the former situations are lower.			
99	Cui, Si-Yuan; Fang, Tie-Feng; Wang, Yong-Qiang	Weak cosmic censorship with excited scalar fields and bound on charge-to-mass ratio	Journal of High Energy Physics	王永强
摘要	Recent study in [1] discovered that introducing a massive charged scalar field and requiring the Weak Gravity Conjecture (WGC) to hold can eliminate a class of Weak Cosmic Censorship Conjecture (WCCC) counterexamples in anti-de Sitter spacetime, indicating a potential connection between WCCC and WGC. In this paper, we extend the study to the case of excited-state scalar fields, and numerically construct the static solutions of excited massive charged scalar fields coupled to the Einstein-Maxwell field in four dimensional spacetime with asymptotically anti-de Sitter boundary conditions. In the absence of scalar field, there is a class of counterexamples to cosmic censorship. However, after adding the scalar field with sufficiently large charge, the original counterexamples can be removed and cosmic censorship is preserved. We find this conclusion also applies to the excited-state of scalar field. There is a minimum value q_c^{bound}. When the charge of the excited scalar field is larger than this minimum value, for sufficiently large boundary electric amplitude a, there will not appear a region with arbitrarily large curvature. That means there exists lower bound on the charge for excited state fields which protects cosmic censorship from being violated.			
100	Hao, Chen-Hao; Sun, Shi-Xian; Huang, Long-Xing; Zhang, Rong; Su, Xin; Wang, Yong-Qiang	Dirac stars in wormhole spacetime	JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS	王永强
摘要	In this paper, we study the spherically symmetric Dirac star model in the presence of a phantom field, obtaining a traversable wormhole solution in non-trivial topological spacetime. This solution exhibits asymmetry in both the field configuration and the metric and possesses a finite ADM mass M and Noether charge Q . Furthermore, due to a wormhole at the center, this solution exhibits many differences from the Dirac star under trivial spacetime. Notably, when the wormhole throat size is small, our numerical calculations indicate the emergence of an extremely approximate black hole solution on one side of the wormhole spacetime, a phenomenon unexplored. At this time, the Kretschmann scalar near the throat tends to infinity, indicating the wormhole becomes untraversable.			

序号	所有作者	题目	期刊名（Source Title）	联系人
101	Long-Xing Huang, Shi-Xian Sun, Rong Zhang, Chen Liang and Yong-Qiang Wang	Excited Dirac stars with higher azimuthal harmonic index	JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS	王永强
摘要	In this paper, we investigate the properties of the first excited state Dirac stars (DSs) with higher azimuthal harmonic index (specifically, the azimuthal harmonic indexes m_D = 3/2, 5/2, 7/2), as well as the relationship between the ADM mass and angular momentum of Dirac stars with respect to frequency. Moreover, we find that the ergospheres of DSs appear at lower spinor field frequencies, and both the ergospheres and the distribution of the spinor field functions are asymmetric about the equatorial plane. Furthermore, we introduce the ground state scalar field and examine its impact on this system, which is known as the multi-state Dirac-boson stars (DBSs) model. We show various types of solution families for DBSs under both synchronized frequency omega and nonsynchronized frequencies and find that similar to DSs, the spinor field and the ergospheres of DBSs are also asymmetric about the equatorial plane, but the ergospheres appear at higher spinor field frequencies.			
102	Su, Xin; Hao, Chen-Hao; Ren, Ji-Rong; Wang, Yong-Qiang	Proca stars in wormhole spacetime	Journal of Cosmology and Astroparticle Physics	王永强
摘要	In this paper, we present the spherically symmetric Proca star in the presence of a phantom field and obtain a traversable wormhole solution for non-trivial topological spacetime. Using numerical methods, symmetric solutions and asymmetric solutions are obtained in two asymptotically flat regions. We find that when changing the throat size r_0, both the ADM mass M and the Noether charge Q no longer have the spiral characteristics of a classic Proca star, furthermore, the asymmetric solution can be turned into the symmetric solution at some frequency ω in certain r_0. In particular, we find that when the frequency takes a certain value, the similar "black-bounce" structure will appear.			
103	Wen-Di Guo, Qin Tan and Yu-Xiao Liu	Quasinormal modes and greybody factor of a Lorentz-violating black hole	Journal of Cosmology and Astroparticle Physics	刘玉孝
摘要	Recently, a static spherically symmetric black hole solution was found in gravity nonminimally coupled a background Kalb-Ramond field. The Lorentz symmetry is spontaneously broken when the Kalb-Ramond field has a nonvanishing vacuum expectation value. In this work, we focus on the quasinormal modes and greybody factor of this black hole. The master equations for the perturbed scalar field, electromagnetic field, and gravitational field can be written into a Schrödinger equation. We use three methods to solve the quasinormal frequencies in the frequency domain. The results agree well with each other. The time evolution of a Gaussian wave packet is studied. The quasinormal frequencies fitted from the time evolution data agree well with that of frequency domain. The greybody factor is calculated by Wentzel-Kramers-Brillouin (WKB) method. The effect of the Lorentz -violating parameter on the quasinormal modes and greybody factor are also studied.			
104	Wang, Xingliang ; Huang, Heyuan; Zhao, Guijuan; Lv, Xiurui; Wei, Wanting ; Liu, Guipeng	High Responsivity of Suspended MoS_2 Photodetector via van der Waals Contact	IEEE TRANSACTIONS ON ELECTRON DEVICES	赵桂娟
摘要	High-performance photodetectors require a reduction of the Schottky barrier at the metal-semiconductor interface. Here, we fabricate a suspended multilayer molybdenum disulfide (MoS_2) flakes photodetector divided into symmetric and asymmetric (with different contact lengths between MoS_2 and the metal electrodes) devices that can balance responsivity and response time. Due to the van der Waals contact, the symmetric suspended MoS_2 photodetector shows high responsivity (upto 307.66 A W^{-1}) in the visible range, short response time (τ_{rise}/ τ_{decay}= 0.25/0.24 s), high specific detectivity D*(upto 4.55 x 10^{11} Jones), and high external quantum efficiency (EQE) (upto 60 000%). The design of the suspended MoS_2 photodetector can be extended to other monolayer or multilayer 2-D materials, providing ideas for a list of high-performance optoelectronic devices.			
105	Rui Hao; Xiaoliang Hu; Lili Luo; Xiaozhan Yang; Qingliang Feng; Yingtao Li; Zemin Zhang	Two-Dimensional Optoelectronic Memristive Device Realized by Ferroelectric Regulation	IEEE Electron Device Letters	李颖弢
摘要	Optoelectronic memristive devices offer significant advantages in brain-like intelligent computers in an energy-efficient manner. However, photon-electron coupling and memristive plasticity, two critical factors in defining performance, are strongly limited by optoelectronic memristive materials and device stricture. To overcome it, a two-dimensional photodetector defined by a ferroelectric with field effect transistors (FET) structure is constructed to perform the device operation. The p-type BP channels provide a broadband optical response for the device, and its resistance has been strategically modulated by tailoring the energy band structure and electron transport through ferroelectric $HfZrO_4$ (HZO) regulation. As a result, the optoelectronic memristive device can demonstrate outstanding electrical properties and synaptic functions, encompassing long-term potentiation (LTP) and long-term depression (LTD), paired-pulse facilitation (PPF). This work demonstrates the advantage of optoelectronic and memristive integration for synergistic modulation and reveals the great potential of BP in optoelectronic memristive devices.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
106	Lei, Yutian; Li, Yumin; Peng, Guoqiang; Xu, Youkui; Wang, Haoxu; Fan, Hengzhong; Zhang, Yongsheng; Ci, Zhipeng; Li, ZhenHua; Wang, Qian; Jin, Zhiwen	Non-Centrosymmetric Chiral Structures for Hybrid Bismuth Halides With Stable Self-Driven X-Ray Detection	IEEE Electron Device Letters	王倩
摘要	Self-driving X-ray detectors have the advantages of low energy consumption, portability, and light weight. However, a complex heterostructure system must be constructed to generate a built-in electric field capable of driving carriers in many scenario. Here, we have pioneered the consideration of spatially breaking the symmetry of crystals, thereby giving them the ability to self-drive carriers, known as the bulk photovoltaic effect (BPVE). Specifically, (R/S -MPZ)$^{2+}$(R/S -MPZ =R/ S-2-Methylpiperazine) chiral ions were introduced to deinduce the crystallization of (R/S -MPZ)BiI_5 in the non-centrosymmetric $P2_12_12_1$ space group. In this framework, the position of the electron cloud in real space is displaced by X-ray irradiation, resulting in self-driving behavior. As a result, our X-ray detectors exhibit a sensitivity of 54 μC Gy_{air}^{-1} cm^{-2} and an ultralow detection limit of 18.4 $nGy_{air}s^{-1}$ under zero bias. In addition, they feature long-term stability over half a year and impressive imaging performance.			
107	Liang, Chen; Ren, Ji-Rong; Sun, Shi-Xian; Wang, Yong-Qiang	Multi-state Dirac stars	EUROPEAN PHYSICAL JOURNAL C	王永强
摘要	In this paper, we construct the multi-state Dirac stars (MSDSs) consisting of two pairs of Dirac fields. The two pairs of Dirac fields are in the ground state and the first excited state, respectively, with opposite spins to ensure that the system possesses spherical symmetry. We discuss the solutions of the MSDSs under synchronized and nonsynchronized frequencies. By varying the ratio of masses between the two sets of Dirac fields, different branches of solutions can be obtained. Furthermore, we analyze the characteristics of the various MSDSs solutions and analyze the relationship between the ADM mass M of the MSDSs and the synchronized and nonsynchronized frequencies. Subsequently, we calculate the binding energy E_B of the MSDSs and discuss the stability of the solutions. Then, we investigated the solutions of the MSDSs under the single particle condition. Finally, we discuss the feasibility of simulating the dark matter halos using MSDSs.			
108	Yan-Bo Zeng, Si-Yuan Cui, Hong-Bo Li, Shi-Xian Sun, Yu-Peng Zhang & Yong-Qiang Wang	Rotating hybrid axion-miniboson stars	EUROPEAN PHYSICAL JOURNAL C	王永强
摘要	We construct rotating hybrid axion-miniboson stars (RHABSs), which are asymptotically flat, stationary, axially symmetric solutions of (3+1)-dimensional Einstein−Klein−Gordon theory. RHABSs consist of an axion field (ground state) and a free complex scalar field (first excited state). The solutions of RHABSs have two types of nodes, including $^1S^2S$ state and $^1S^2P$ state. For different axion decay constants f_a, we present the mass M of RHABSs as a function of the synchronized frequency, as well as the nonsynchronized frequency, and explore the mass M versus the angular momentum J for the synchronized frequency and the nonsynchronized frequency, respectively. Furthermore, we study the effect of axion decay constant f_a and free scalar field mass μ_f on the existence domain of the synchronized frequency ω.			
109	Hailong Du , Guijuan Zhao *, Guipeng Liu , Xiurui Lv , Wanting Wei , Xingliang Wang	Analysis of the heterojunction band offset of h-BN/TMDCs	Applied Surface Science	赵桂娟
摘要	In order to analyze the effect of the chalcogen on the band alignment of the Transition metal dichalcogenides (TMDCs) and hexagonal Boron Nitride (h-BN) heterojunction, we fabricated the h-BN/TMDCs heterojunction by vertically stacking mono-layer h-BN and multi-layer TMDCs by the wet transfer method. The four heterojunctions are h-BN/WS_2 , h-BN/WSe_2 , h-BN/MoS_2 and h-BN/$MoSe_2$. X-ray photoelectron spectroscopy (XPS) has been employed to ascertain the Valence Band Offset (VBO) at the junctions created among these heterojunctions. All heterojunction band alignment styles are type-I. When the chalcogen changes from S to Se, the heterojunction VBO values increase. Specifically, in case of h-BN/WS_2 and h-BN/WSe_2 the VBO is 2.42 eV and 2.81 eV, respectively, and the magnitude of the difference is 0.39 eV. In the same case for h-BN/MoS_2 and h-BN/$MoSe_2$ the VBO is 2.52 eV and 2.55 eV, respectively, and the magnitude of the difference is 0.03 eV. The aforementioned research has obtained the band alignment for four heterojunctions, which provides a valuable reference for the design and analysis of the correlation devices in the future.			

序号	所有作者	题目	期刊名（Source Title）	联系人
110	Yang Yifan, An Beixi, Wu Zhengkun, Wang Yanrong*, Li Ruixia, Wang Peizhe, Zhang Tingyu, Han Ruiqi, Xie Erqing*.	Room temperature ppb level-NO_2 sensor based on WS_2 with Fe -ni co-catalyst modification	Applied Surface Science	谢二庆
摘要	Rapid and highly sensitive detection of toxic gases at room temperature is crucial for ensuring health protection. However, the sensing materials reported thus far face the challenge of exhibiting relatively low response values at room temperature. In this study, we propose a facile synthesis method to prepare a Fe and Ni co-doped WS_2 gas sensor capable of detecting nitrogen dioxide (NO_2) at parts-per-billion (ppb) levels even at room temperature. The Fe-Ni@WS_2 gas sensor exhibits excellent response performance (The response value is 81 at 1 ppm NO_2). The incorporation of Fe and Ni into WS_2 forms a Schottky junction that effectively regulates charge transfer behavior within the sensor material through conduction tunneling. Furthermore, the catalytic properties of Fe and Ni promote gas-sensitive reactions on the surface of WS_2. This investigation elucidates the sensing mechanism of WS_2 towards NO_2 under bimetallic modification and provides an effective approach for constructing highperformance gas sensors through rational design of active sites.			
111	Haiqing Jiang , Xukun Wang , Xinge Wang , Yuan Lin , Yuhao Zhang , Qingfeng Wu , Yan Ding , Meixia Su , Guo Liu , Erqing Xie , Jinyuan Zhou , Juan Li , Zhenxing Zhang	Ultra-low hydrogen sulfide gas detection of metal-organic framework derived hollowed-out rod-shaped copper oxide nanostructures	Applied Surface Science	张振兴
摘要	Highly selective detection of hydrogen sulfide (H_2S) at low temperatures has broad applications in industries, agriculture, and the healthcare sector. However, the practical application of metal oxide semiconductor (MOS) resistive gas sensors is greatly limited by their inherent high operating temperature, low response, and low selectivity. To further enhance the detection performance of H_2S gas, this study proposes and investigates an efficient hydrogen sulfide (H_2S) gas sensor based on hollowed-out rod-shaped copper oxide (CuO) derived from metal-organic frameworks (MOF). The sensor material was synthesized using a solvothermal method to prepare the precursor copper terephthalate metal−organic frameworks (CuBDC) and then calcinated under high temperatures. The sensor prepared at 500 °C exhibits the most outstanding gas sensitivity, with a response as high as 330 (Rg/Ra) to 1 ppm H_2S at room temperature (20 °C) and theoretical detection limits at the ppt level, excellent selectivity and stability. The gas sensing mechanism is briefly explained through an oxygen adsorption model. The research results underscore the potential application prospects of this sensor in H2S detection, providing a new direction for developing high-performance, low-cost, and highly efficient gas sensors.			
112	Xiurui Lv,Guipeng Liu,Guijuan Zhao, Linsheng Liu, and Jianhong Yang	α-In_2Se_3-based heterojunction photodetector using Nb-doped MoS_2	APPLIED PHYSICS LETTERS	刘贵鹏
摘要	The built-in electric field at the heterojunction interface can effectively separate electron-hole pairs, which can effectively increase the photocurrent and suppress the dark current. The p-n junction can provide a good depletion layer, so p-n junction photodetectors based on two-dimensional materials are rapidly developing. In this study, Nb-doped MoS_2 as a p-type semiconductor and n-type α-In_2Se_3 were used to form a van der Waals heterojunction photodetector. This photodetector achieves photodetection in the visible to near-infrared range with a responsivity (R) of 87 A/W and a specific detectivity (D*) of 7.5 x 10^{11} Jones. The carriers introduced by doping make the device less suppressive to dark currents, but maintain a high photoresponsivity. This study adopts doping modulation of the conductive properties for p-n junction photodetectors, and the results are expected to further enhance the photodetection performance.			
113	Xiling Li, Yuping Yao, Fusheng Ma, Jianbo Wang, Guozhi Chai	Mode transformation of dynamic spin wave well modes in the magnetic stripes	Applied Physics Letters	李喜玲
摘要	In this work, we present an experimental and micromagnetic simulation study of the mode transformation of dynamic spin wave well modes in the magnetic stripes. With a highly precise lock-in ferromagnetic resonance measurement system, the spin wave modes, including the quantized backward volume magnetostatic spin waves and the spin wave well modes, can both be clearly detected in the transversely magnetized stripes. The mode transformations of dynamic spin wave well modes are detected in a field range that the moments near the edge of the stripe are not fully magnetized. Further micromagnetic simulation and analyzation show that the boundary condition change in the potential well might be the main reason for the mode transformation of spin wave well modes. These results might be helpful for the further understanding of the spin wave dynamics in the finite ferromagnets.			

文章列表

序号	所有作者	题目	期刊名（Source Title）	联系人
114	Xiaolei Li ; Qingfang Liu ; Huifang Qiao; Shuai Mi ; Huiliang Wu; Runliang Gao; Yuchen Ye ; Jianbo Wang	Effects of surface acoustic waves on reversal of magnetic domains in patterned films with perpendicular magnetic anisotropy	APPLIED PHYSICS LETTERS	王建波
摘要	In this work, the magnetization reversal of patterned Pt/Co/Pt multilayers influenced by surface acoustic waves is investigated. For each patterned cell, the magnetization reversal involves formation of a reversal nucleus followed by rapid motion of a domain wall. The nucleation probability of the reversal nucleus increases with the power of the applied surface acoustic wave, which is explained by the magnetic droplet model, and fitting the experimental results with this model gives important parameters such as the domain-wall energy density and the reduction rate of local perpendicular anisotropy. The fitting results for different patterned cells are consistent with the experimental results, which validates this model for dealing with such issues.			
115	Yu Shi, Vladimir Koval, and Chenglong Jia	Dynamic magnetoelectric effect in bismuth-layer structured Aurivillius ceramics	Applied Physics Letters	贾成龙
摘要	Multiferroic materials have been developed and studied for decades due to their potential applications in microelectronics and spintronics, such as multi-state digital memories, energy storage, and ultra-fast electric field-controlled magnetic sensors. Among these materials, magnetoelectric multiferroics exhibit a magnetoelectric (ME) interaction allowing for the manipulation of polarization by a magnetic field and magnetization by an electric field through internal strain and/or charge. However, strain-mediated ME effect is time-consuming and inefficient at high frequencies (~ GHz). To address this issue and pave the way toward high frequency applications of ME multiferroics, we have systematically designed and characterized layered $Bi_4FeTi_3O_{15}$-type Aurivillius ceramics for a strong dynamic ME coupling in the GHz band. By introducing cobalt and niobium ions into $Bi_{4-3}Gd_{0.7}FeTi_3O_{15}$, a phase evolution from a four-layered structure to a mixed structure consisting of four- and three-layered phases was revealed. The Co/Nb co-doping was found to enhance the magnetization at room temperature while preserving ferroelectricity. The understanding of the substitution-enhanced dynamic ME coupling at satellite and radar communication frequencies is expected to broaden the range of applications for ME multiferroics.			
116	Jie Xu, Fu Liu, Mingsu Si, and Changjun Jiang	Piezostrain control of orbital Rashba effect in Py/CuO_x/PMN-PT heterostructures	Applied Physics Letters	蒋长军
摘要	Electric-field modulated magnetic properties have attracted numerous research studies to elucidate the underlying physics and develop practical electronic devices. In this work, it is demonstrated that the orbital Rashba effect can be modulated by the applied electric field, which is reflected by the variation of charge-to-orbital conversion efficiency ξ under different electric fields in Py/CuO_x/PMN-PT heterostructures, where ξ displays a butterfly-like behavior with the electric field, which can be attributed to the piezostrain-mediated magnetoelectric coupling, thus realizing the effective modulation of orbital torque related to the orbital Rashba effect. In addition, our first-principles calculations demonstrate that the orbital moment increases upon increasing strain, which stems from the enhanced p-d hybridization of the interfaced O and Cu atoms. Our results provide a method for modulating the orbital Rashba effect and charge-to-orbital conversion, which shows good potential for practical applications.			
117	Caiyun Qi,Baorui Xia,XuebingPeng,Xingdong Jiang,Daqiang Gao	Surface atomic bidirectional migration modulated electrocatalytic activity in Co_2MnO_4 nanoparticles	Applied Physics Letters	高大强
摘要	Polymetallic cationic spinel-type oxides are increasingly being used as catalysts for oxygen reduction/oxygen evolution reactions (ORR/OER). Here, we have modified the anti-spinel Co_2MnO_4 using a quenching strategy (CMO-Q) and demonstrated that the bidirectional migration of Co and Mn cations at the tetrahedral/octahedral positions is the essential reason for enhancing the ORR/OER performance. Electrochemical test results show that CMO-Q is better than Co_2MnO_4, OER initial potential decreased by 100 mV, and ORR current density increased from 4.2 to 7.3 mA cm^{-2} at 1600 rpm, with more stable CMO-Q-based zinc-air battery performance. Meanwhile, density functional theory calculations confirm that the primary factor contributing to the reduction of distance from the d-band center of Co and Mn to the Fermi level is the conductivity enhancement. This study offers insight into regulating the surface atomic migration and catalytic performance of spinel without compromising its stable structure.			

序号	所有作者	题目	期刊名（Source Title）	联系人
118	Xuebing Peng, Baorui Xia, Mingsu Si and Daqiang Gao	Electronic correlation-driven quantum anomalous valley Hall effect in intrinsic ferrovalley FeClBr	Applied Physics Letters	高大强
摘要	Both ferrovalley and quantum anomalous valley Hall effect (QAVHE) are practically desirable and inherently fascinating for new-style device applications. However, works realizing the intrinsic ferrovalley and QAVHE in a single ferromagnetic system with a high Curie temperature are still lacking. We predict that monolayer FeClBr exhibits the ferrovalley phase with a substantial valley polarization of 116 meV and high Curie temperature of approximately 565 K. When considering electronic correlation effects, within the range of U_{eff} = 0.87 eV and U_{eff} = 1.13 eV, the QAVHE of nontrivial topology is present. A Chern number of C = -1 is confirmed by chiral edge states and an anomalous Hall conductivity. Intriguingly, the emergence of out-of-plane easy magnetization when U_{eff} < 1.13 eV is conducive to realizing the intrinsic ferrovalley and QAVHE. The QAVHE is also present in monolayers of FeCII and FeBrI. Our study offers potential candidate materials for the advancement of multifunctional quantum devices in topology and valleytronics.			
119	Jianrong Zhang,1 Yuzhi Li,1 Xiaodong He,1 Qi Zhang,1 Ze Yan,1 Yuhan Chang,1 Baoshan Cui,1 Yalu Zuo,1 Yan-bin Sheng,2,3,a) and Li Xi1	Swift heavy ion irradiation-induced enhancement of spin– orbit torque efficiency in Pt/Co/Ta trilayers	APPLIED PHYSICS LETTERS	席力
摘要	Increasing the efficiency of spin-orbit torque (SOT) is of great interest in applications for magnetic random access memory and logic devices due to decreased energy consumption. Here, we present that the SOT efficiency of Pt/Co/Ta films with perpendicular magnetic anisotropy can be improved by swift high-energy heavy Fe^{11+} ion irradiation, which is an effective method to alter crystallinity, interface roughness, and defects in ferromagnet/heavy metal heterostructures. Specifically, the Pt/Co/Ta films show an optimal SOT efficiency at ion fluence around 1.0 x 10^{13} ions/cm^2 with the largest spin Hall angles reaching 0.59, which is the largest improvement of spin Hall angle by ion irradiation compared to previous studies using light ions. We demonstrate that the increase in SOT efficiency arises from structural changes in the Pt layer due to ion irradiation-induced damage effects at proper fluence, while the decrease in SOT efficiency is mainly attributed to the restoration of Pt crystallinity induced by beam-heating effects at high fluence. This work demonstrates that an appropriate ion irradiation process could improve the SOT efficiency and the spin Hall angle, thereby providing a way to develop future SOT-based spintronic devices.			
120	Rongrong Chen,Jin Gao,Lei Yang,Xiaowen Shi, Desheng Xue, Chenglong Jia, and Kun Tao	Ultra-flatbands in twisted penta-hexa-CB bilayer with large twist angles	Applied Physics Letters	陶琨
摘要	We report the discovery of ultra-flatbands in twisted penta-hexa-carbon boron (PH-CB) bilayers, a finding with profound implications for condensed matter physics. Using first-principles calculations, we show that PH-CB bilayers exhibit an exceptionally narrow bandwidth of 0.13 meV at a distortion angle of 9.6 °, indicating the robust electron correlation effects. This observation contrasts with the need for tiny twist angles in graphene to achieve similar effects. The PH-CB system, with its indirect bandgap of 2.11 eV, represents a versatile platform for exploring novel electronic phenomena that may lead to advances in quantum materials. Our results highlight the inverse relationship between wave function localization and bandwidth and provide a new perspective for the design of two-dimensional materials with tailored electronic properties.			
121	Xiangjie Kong, Wenjie Song, Chaozhong Li, C. K. Ong, and Guozhi Chai	Dipolar induced nonreciprocal magnon hybridization in FeNi/YIG bilayers	Applied Physics Letters	柴国志
摘要	We investigated the magnon hybridization behavior in FeNi films, which were deposited on the yttrium-iron garnet (YIG) films by using Brillouin light scattering. Nonreciprocal magnon hybridizations have been detected not only on the mode densities but also the dispersion relations. The perpendicular standing spin wave mode confined in the thickness direction hybridized with the top surface magnetostatic surface spin wave at smaller wave vectors range while hybridized with the bottom surface mode at larger wave vectors range. The dipolar interaction between the FeNi layer and the YIG layer should be the main reason for the nonreciprocal hybridization of the two modes in the FeNi layer. The nonreciprocal hybridization characteristics of FeNi/YIG double-layer magnetic films enrich the nonreciprocal magnon hybridization system and might have potential application in constructing spin wave-based devices.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
122	Ding, Y (Ding, Yan) [1] ; Lin, Y (Lin, Yuan) [1] ; Zhang, YH (Zhang, Yuhao) [1] ; Jiang, HQ (Jiang, Haiqing) [1] ; Su, MX (Su, Meixia) [1] ; Xie, EQ (Xie, Erqing) [1] ; Zhang, ZX (Zhang, Zhenxing) [1]	N-doped MoS_2@indium tin oxide (ITO) core–shell nanowires for high-performance ammonium ion micro-supercapacitor	APPLIED PHYSICS LETTERS	张振兴
摘要	Ammonium (NH_4^+) ion aqueous supercapacitors have gained significant attention due to their notable cost-effectiveness, safety profile, and environmental benefits. Despite this, the optimization of the capacitive performance of electrode materials for NH_4^+ ion storage remains inadequate. To tackle these challenges, we present a composite electrode depend upon molybdenum disulfide (MoS_2) and indium tin oxide nanowires (MoS_2@ITO NWs) as the primary host for (NH_4^+) ions. Additionally, we introduce a straightforward radio frequency nitrogen (N) plasma technique to incorporate nitrogen doping into the MoS_2 film, thereby enhancing its performance. The introduction of N plasma doping into two-dimensional MoS_2 results in an expansion of the interlayer distance and an improvement in electronic conductivity. This, in turn, facilitates the facile and highly reversible insertion and extraction of NH_4^+ ions during cycling. Consequently, the N plasma doping significantly enhances the device areal capacitance of MoS_2@ITO NWs, increasing it from 78.6 to 161.8 mF cm^{-2} at 1 mA cm^{-2}, with an exceptional capacity retention (>89.2% after 10 000 cycles) and superior rate capability up to 10 mA cm^{-2}. The integration N of atoms within the straightforward hierarchical core-shell design strategy exhibits promising prospects for bolstering the performance of metal sulfide electrodes and other high-capacity electrode materials aimed at energy storage applications.			
123	Shuai Mi, Chenbo Zhao, Meihong Liu, Jianbo Wang, and Qingfang Liua	Detection of spin current generated by the acoustic spin–rotation coupling mechanism via acoustic voltage	Applied Physics Letters	刘青芳
摘要	The method of combining surface acoustic waves (SAWs) with electrical detection has promoted the study of phonon-spin coupling and spintronics. Aiming at problems of difficult detection of DC voltage and unknown origin of spin current caused by SAW in ferromagnetic/light metal systems, we constructed the Ni/Cu/Ta on $LiNbO_3$ substrate and measured acoustic voltages directly, which are used to analyze the spin current induced by SAW. By analyzing the angular dependence of acoustic voltages and estimating the maximum spin current, it is determined that acoustic voltages originate from the acoustic spin-rotation (ASR) coupling and the acoustic spin pumping (ASP) effects. The angular dependence shows that for the longitudinal voltage, the contribution of ASR to ASP is in the ratio of 3.22/3.77, while the transverse voltage is mainly contributed by the ASR. The maximum spin current due to ASR is 0.97 x 10^5 A/m^2, while that due to ASP is 1.47 x 10^5 A/m^2. This work provides ideas for the design of phonon-spin coupled devices.			
124	Wanting Wei, Guijuan Zhao,Xiurui Lv, Xingliang Wang, and Guipeng Liu	The determination of WSe_2/GaN heterojunction band offsets in the semipolar (11–22) and nonpolar (11–20) planes by x-ray photoelectron spectroscopy	Applied Physics Letters	赵桂娟
摘要	Wurtzite structured GaN has a severe polarization effect in the c (0001) plane, compared to which the polarization effect is small in the semipolar (11-22) plane, and there is no polarization effect in the nonpolar (11-20) plane GaN. To investigate the influence of the polarization effect on the band bending at the heterojunction interface, we fabricated tungsten diselenide (WSe_2)/(0001) GaN, WSe_2/(11-22) GaN, and WSe_2/(11-20) GaN heterojunctions. We measured the heterojunction valence band offsets (VBOs) by X-ray photoelectron spectroscopy. The VBOs of the three WSe_2/GaN heterojunctions were measured to be 2.43 ± 0.15, 2.51 ±0.15, and 2.23± 0.15 eV, and the conduction band offsets were calculated to be 1.11 ± 0.15, 1.19 ± 0.15, and 0.91 ± 0.15 eV, showing the type II energy band alignment of the three heterojunctions. The results demonstrate that WSe_2/(11-22) GaN-faced heterojunction band bending is the largest. This provides theoretical insights for two-dimensional WSe_2 and three-dimensional semipolar (11-22) GaN and nonpolar (11-20) GaN heterojunction device preparation.			
125	Huibo Liu, Chenhui Zhang, Chen Liu, Aitian Chen, Dongxing Zheng, Yong Peng, Jinwu Wei, Qingfang Liu, Jianbo Wang, Senfu Zhang, Xixiang Zhang	Writing and deleting skyrmions by electron beam in van der Waals ferromagnet Fe_3GeTe_2	Applied Physics Letters	张森富
摘要	Magnetic skyrmions are potential candidates for low-power spintronic devices. Recently, skyrmions have been observed in two-dimensional van der Waals ferromagnets, which extends the range of skyrmion hosting materials to atomically thin limit. However, creating and deleting skyrmions at precise locations is still a challenge for practical applications. In this study, we proposed a solution to this problem. Using in situ Lorentz transmission electron microscopy, we investigated magnetic domain structures in Fe_3GeTe_2 exfoliated single crystal flakes and found that the skyrmions in this sample are of the Néel type. Interestingly, we found that the skyrmions could be created and deleted at specific locations using a focused electron beam. Micromagnetic simulations results agree well with the experimental results, providing insights into the underlying mechanisms. The methods presented in this work can be extended to other skyrmion material systems, thereby advancing the field of skyrmion-based technologies.			
126	Ying Jin, Pengyang Gou, Fu Liu, Yibing Zhao, and Changjun Jiang	Contribution of spin pumping to magnon–magnon coupling in YIG/Py heterostructure	APPLIED PHYSICS LETTERS	蒋长军
摘要	We investigate the strong correlation between magnon-magnon coupling (M-M coupling) and coherent spin pumping in yttrium iron garnet/permalloy ($Y_3Fe_5O_{12}$, YIG/Py) heterostructure through spin-torque ferromagnetic resonance technique. We demonstrate experimentally that the spin pumping of hybrid modes is the strongest near the coupling region at 295 K, indicating that coherent spin pumping is closely associated with magnon hybridization. Meanwhile, the coupling strength g_c increases from 0.26 to 0.37 GHz with temperature reduction from 295 to 260 K, which is attributed to the enhancement of spin pumping, especially the hybrid mode characterized by spin pumping out of Py that provides a pronounced contribution. Furthermore, the increased linewidth of the hybrid mode near the coupling region at low temperatures leads to enhanced spin mixing conductivity. This enhancement, in turn, improves spin pumping. Our experiments discuss the underlying mechanisms that influence coupling strength in detail, providing deeper insights into tuning M-M coupling.			
127	Hongru Zhao, Xinkong Wei, Ruiyin Gu, Mingzheng Xie, Weihua Han	Enhanced water splitting on (010) facet-exposed $BiVO_4$ photoanode with improved carrier injection efficiency	Applied Physics Letters	韩卫华
摘要	Transition metal oxide semiconductors, noted for their stability and suitable bandgap, are promising photoanodes for water splitting. Surface engineering is critical to tackle issues like low carrier mobility and charge recombination, stemming from atomic arrangement and Fermi level differences. While exposing dominant crystal facets boosts photocatalytic capability, it can hinder carrier injection into the electrolyte. In this study, $BiVO_4$ films with various facet exposures were synthesized and characterized using scanning electron microscopy and X-ray diffraction to confirm their morphology and crystalline structure. Mott-Schottky analysis was employed to investigate changes in the band structure near the semiconductor-electrolyte interface, revealing that high (010)-$BiVO_4$ facet exposure enhances carrier separation but reduces injection efficiency. The results from photoconductive atomic force microscopy tests demonstrated that enhanced band bending at the semiconductor interface improves hole transfer. Coating the (010)-$BiVO_4$ photoanode with MoS_2 and an amorphous ZrO_2 interlayer yielded a photocurrent density of 0.6 mA cm^{-2}at 1.2 V (vs RHE) under AM 1.5 G illumination, tripling the pristine photoanode's performance and nearly tripling water splitting efficiency. Mechanism revealing the improved photoelectrochemical performance is attributed to a greater band bending on the $BiVO_4$ surface, enhancing hole injection dynamics. This work provides a feasible strategy for a deeper understanding of the intrinsic mechanisms of facet engineering and improving the activity of photoanodes.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
128	Zu-Jian Ying	Robust Topological Feature against Non-Hermiticity in Jaynes–Cummings Model	Advanced Quantum Technologies	应祖建

摘要

The Jaynes-Cummings Model (JCM) is a fundamental model and building block for light-matter interactions, quantum information and quantum computation. The present work analytically analyzes the topological feature manifested by the JCM in the presence of non-Hermiticity which may arise from dissipation and decay rates. Indeed, the eigenstates of the JCM are topologically characterized by spin windings in 2D plane. The non-Hermiticity tilts the spin-winding plane and induces an out-of-plane component, while the topological feature is maintained. In particular, besides the invariant spin texture nodes, the study reveals a non-Hermiticity-induced reversal transition of the tilting angle and spin winding direction with a fractional phase gain at gap closing, a partially level-independent reversal transition without gap closing, and a completely level-independent super-invariant point with untilted angle and also without gap closing. The result demonstrates that the topological feature is robust against non-Hermiticity, which may be favorable in practical applications. On the other hand, one may conversely make use of the disadvantageous dissipation and decay rates to reverse the spin winding direction, which may add a controlled way for topological manipulation of quantum systems in light-matter interactions.

Jaynes-Cummings Model (JCM) is fundamental in light-matter interactions. The topological feature manifested by JCM is rigorously shown to be robust against a general non-Hermiticity induced by dissipation and decay rates. The non-Hermiticity only tilts the spin winding plane, while the winding number is preserved. The robustness is favorable for practical applications and the revealed properties useful for designing topological quantum devices. image

序号	所有作者	题目	期刊名（Source Title）	联系人
129	Zu-Jian Ying	Universal Quantum Fisher Information and Simultaneous Occurrence of Landau-Class and Topological-Class Transitions in Non-Hermitian Jaynes-Cummings Models	Advanced Quantum Technologies	应祖建

摘要

Light-matter interactions provide an ideal testground for interplay of critical phenomena, topological transitions, quantum metrology, and non-Hermitian physics with high controllability and tunability. The present work considers two fundamental non-Hermitian Jaynes-Cummings models in light-matter interactions that possess real energy spectra in parity-time (PT) symmetry and anti-PT symmetry. The quantum Fisher information is shown to be critical around the transitions at the exceptional points and exhibit a super universality, with respect to different parameters, all energy levels, both models, symmetric phases, and symmetry-broken phases, which guarantees a universally high measurement precision in quantum metrology. In particular, the transitions are found to be both symmetry-breaking Landau-class transitions (LCTs) and symmetry-protected topological-class transitions (TCTs), thus realizing a simultaneous occurrence of critical LCTs and TCTs that are conventionally incompatible due to contrary symmetry requirements. Besides establishing a paradigmatic case to break the incompatibility of the LCTs and the TCTs in non-Hermitian systems, the both availabilities of the sensitive critical feature and the robust topological feature can also provide more potential for designing quantum devices or sensors.

In non-Hermitian Jaynes-Cummings Models with parity-time (PT) and anti-PT symmetries, the quantum Fisher information is shown to be critical around exceptional points and manifests a super universality, promising a universally high measurement precision for quantum metrology. Simultaneous occurrence of the conventionally incompatible critical Landau-class transition and topological-class transition is realized, with conceptional renovation and more potential of applications in designing quantum sensors. image

序号	所有作者	题目	期刊名（Source Title）	联系人
130	Zu-Jian Ying	Front Cover: Robust Topological Feature against Non-Hermiticity in Jaynes–Cummings Model (Adv. Quantum Technol. 7/2024)	Advanced Quantum Technologies	应祖建

摘要

Quantum coherence suffers from environmental influence but the topological feature may not. In article number 2400053, Zu-Jian Ying rigorously shows that the topological feature manifested by the fundamental Jaynes–Cummings model of light–matter interaction is robust against a general non-Hermiticity induced by dissipation and decay rates. The non-Hermiticity only tilts the spin winding plane, while the winding number is preserved. Several revealed properties may be useful for designing topological quantum devices.

序号	所有作者	题目	期刊名（Source Title）	联系人
131	Liu, Huiya Shao, Jialin Zhao, Jia Zhao, Jingjing Zhang, Zemin Huo, Hongqing	Photoelectrodes with Enhanced Carrier Generation and Collection Through Optical Simulation and Materials Engineering	Advanced Optical Materials	张泽民

摘要

The efficiency of solar-fuel conversion in photoelectrochemical (PEC) systems is hindered by significant losses of photons and photocarriers within the photoelectrodes. This study introduces an innovative ITO@In_2S_3 core-shell nanowire structure designed to overcome these challenges through cutting-edge materials engineering and sophisticated simulation techniques. Optical modeling and finite element simulations highlight the conflict between photocarrier generation and collection in planar In_2S_3 thin films and demonstrate how the core-shell nanowire geometry can significantly enhance light absorption. The developed ITO@In_2S_3 nanowire photoanodes achieve a photocurrent of 11.3 mA cm^{-2} at 1.23 V versus RHE, which is nearly five times greater than that of planar ITO/In_2S_3 thin films. Characterization techniques, including UV-vis absorption and charge separation efficiency measurements, confirm the enhanced light absorption and improved carrier collection facilitated by broadening the optical absorption range and reducing carrier transport distances. This research not only deepens the understanding of the dynamics within thin-film photoelectrodes but also paves the way for the development of more efficient technologies for solar fuel conversion.

序号	所有作者	题目	期刊名（Source Title）	联系人
132	Sheng, Hongwei,Yuqi Ma,Haoshuo Zhang, Jiao Yuan, Fengfeng Li, Wenquan Li, Erqing Xie, and Wei Lan	Integration of Supercapacitors with Sensors and Energy-Harvesting Devices: A Review	ADVANCED MATERIALS TECHNOLOGIES	兰伟

摘要

The vigorous development of wearable and implantable electronics provides a series of new solutions for human health monitoring and disease diagnosis and treatment. Considering the particularity of the operating environment, this also puts forward higher requirements for energy storage devices (ESDs). Supercapacitors stand out from many ESDs due to their unique advantages, such as high power density, long life, and ease of fabrication. For different application requirements, supercapacitors are developing toward flexibility, multifunction, and integration. This review highlights the recent progress in developing supercapacitor-integrated systems. Smart supercapacitors with unique properties, their applications, and integrations with various sensors and/or energy-harvesting devices are discussed and summarized thoroughly. Furthermore, the all-in-one device enabled by compatible materials and ingenious structure design is also described. From practical perspectives, the key challenges facing the development of supercapacitor-integrated systems are presented, and the suggestions for future research directions are given.

序号	所有作者	题目	期刊名（Source Title）	联系人
133	Peng, Guoqiang; Qiu, Fu; Li, Zhenhua; Wang, Haoxu; Li, Qijun; Jin, Zhiwen	Single-Source Evaporated High-Quality Single-Phase $Cs_3Cu_2I_5$ Scintillator Films for High Performance X-Ray Imaging	Advanced Functional Materials	靳志文

摘要

Vacuum-evaporated metal halides (MHs) scintillator thick films have received much attention in the X-ray imaging field due to their excellent light yield and uniform large-area preparation. However, the inevitable heteromorphic homologs in MHs (e.g., Copper-based MHs (Cu-MHs): $CsCu_2X_3$\$Cs_3Cu_2X_5$) and change of film structural backbone will result in spectral hybridization (phase purity), and the film eventually detaches (lattice mismatches). Herein, a single-source vacuum evaporation method to prepare a thick film (≈10 µm) of Cu-MHs (as an example) scintillators is realized: 1) Presynthesis of pure phase materials by solution method with a protective agent to ensure phase purity without precise control of component ratios in evaporation process; 2) One-shot formation of film structural backbone avoids stress accumulation and utilize the longitudinal growth characteristics of crystalline films to obtain crystal orientations with better optical outputs. Finally, the films obtained have a light yield comparable to a partially single-crystal (53 983 photons MeV^{-1}) and an imaging resolution (14.1 lp mm^{-1}) comparable to the partial template method. The detection system based on the prepared Cu-MHs scintillator thick films exhibits good response speed and linearity in response to different X-ray radiation intensities and exposure times. The method will further drive the application of MHs is believed.

序号	所有作者	题目	期刊名（Source Title）	联系人
134	Xiaowei Jin, Tong Li, Yuping Yao, Chaojie Wang, Huigang Shi, Guozhi Chai, Daqiang Gao, Chenglong Jia, Li Xi, Desheng Xue	MHz High Performance of Soft Magnetic Composite with Ordered Domain Structure for Efficient Conversion of Electrical Energy	Advanced Functional Materials	薛德胜

摘要

Soft magnetic materials are a core element of power electronics and electrical machines. However, none of the soft magnetic materials is able to exploit the full potential of wide bandgap semiconductors, which operate above MHz frequency for efficient energy conversion in power electronic systems. Here, a high-performance Fe-Si soft magnetic composites with a 2D ordered domain structure are reported, enabling efficient energy conversion at MHz frequencies. By transforming spherical particles into flakes and arranging them in layers, 2D magnetic domains are created within the composite. This leads to a 90% increase in permeability and a tenfold decrease in loss at 3 MHz compared to composite made with spherical particles. The significantly increased cut-off frequency indicates that the ordered flaky particles are suitable for MHz applications, unlike the disordered spherical particles. These findings provide an effective approach for fabricating high performance soft magnetic composites from traditional spherical particles and miniaturizing magnetic devices for efficient power electronics operation.

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序号	所有作者	题目	期刊名（Source Title）	联系人
135	Shao, Jialin Liu, Huiya Jiang, Xiao Wang, Yujie Luo, Lili Li, Yingtao Zhang, Zemin Lu, Bingan	High Performance Ferroelectric - modulated Photoelectrodes by Using Grid Charge Collector	Advanced Functional Materials	张泽民
摘要	Metal oxide-based photoelectrochemicals (PEC) are promising for solar-fuel conversion if the issues of excessive charge carrier recombination in bulk can be resolved. Ferroelectric modulation of photoelectrodes is a remedial strategy but is less available due to the contradiction between the screening effect and free carrier collection. This work designed and fabricated a novel ferroelectric-modulated photocathode (p-type $CuBi_2O_4$/PbZrTiO, CBO/PZT) with gird-like gold (G-Au) charge collector under theoretical guidance. Several characterizations, including Multiphysics simulations and optoelectronic and interfacial electronic energy levels calculations, proved the critical role of the G-Au charge collector in decoupling charge collecting and screening. As a result, the positively polarized photocathode exhibited the best performance with an average H_2O_2 concentration around 1.5 mol (L h $m^2)^{-1}$. Thus, this work demonstrated the successful integration of ferroelectric in PEC photoelectrodes with improved photocarrier collection using a grid metal collector, which can be broadly applied to other optoelectronic systems.			
136	Jinli Zhu, Qianyang Zhou, Linchuan Wang, Wanhai Zhou, Minghua Chen, Xin Liu,* Daqiang Gao,* and Dongliang Chao*	Homogenic Boundary Effect Boosted Oxygen Evolution Reaction in α /β -$NiMoO_4$ for Rechargeable Aqueous Zn-Air Battery	Advanced Energy Material	高大强
摘要	Rechargeable Zn-air batteries (ZAB) represent a promising avenue for sustainable energy storage, boasting high energy density, cost-effectiveness, scalability, and environmental friendliness. However, the sluggish redox kinetics and limited cycle life of bifunctional oxygen evolution/reduction (OER/ORR) electrocatalysts impede the further practical development of ZABs. In this study, homogenic boundary effect within α/β-$NiMoO_4$ is introduced as a superior electrocatalyst for ZAB. Through in situ poikilothermic X-ray diffraction, X-ray absorption spectroscopy, and theoretical investigations, the active Ni atoms exhibit more effective electron transfer at α/β-$NiMoO_4$ due to the homogenic boundary effect is unveiled. Furthermore, the presence of oxygen vacancies and lattice distortions at these boundaries significantly reduces the thermodynamic barrier of OER to a mere 0.46 V. Consequently, α/β-$NiMoO_4$ demonstrates a remarkably low overpotential of 270 mV at 10 mA cm^{-2} for the bottlenecked OER, along with prolonged durability (150 h) and a high specific capacity (745 mAh g^{-1} at 5 mA cm^{-2}) for ZAB. This study underscores the efficacy of homogenic boundary effects in enhancing electrocatalytic activities, offering great promise for the advancement of sustainable energy systems.			
137	Zhao, Qian; Luo, Xuming; Wu, Huiliang; He, Bin; Wang, Quwen; Zhang, Tengfei; Li, Zimu; Liu, Pan;Zhao, Chenbo; Wang, Jianbo; Liu, Qingfang; Yu, Guoqiang; Wei, Jinwu	Efficient Charge-to-Orbit Current Conversion for Orbital Torque Based Artificial Neurons and Synapses	Advanced Electronic Materials	魏晋武
摘要	Orbital Hall effect (OHE) in light metal materials has attracted significant attention due to its potential applications in innovative orbitronic devices. Here, the OHE in titanium film is investigated and the orbital torque efficiency in Pt/$[Co/Ni]_3$/Ti multilayers is characterized. A notable effective field per unit current density of orbital torque is achieved, nearing 560 Oe per 107 A cm^{-2} in a sample featuring 25 nm Ti layer. The corresponding orbital torque efficiency is approximate to 0.25. The resulting orbital torque effectively switches the perpendicularly magnetized moments in Co/Ni multilayers. In contrast, a reference sample of Pt/$[Co/Ni]_3$/Pt demonstrates significantly lower switching efficiency. Furthermore, it is demonstrated that the multi-states switching driven by orbital torque in Pt/$[Co/Ni]_3$/Ti structure can mimic the behaviors of artificial neurons and synapses. This work not only enhances the understanding of the orbital torque but also offers the development of novel orbitronic devices based on OHE.			
138	Chao Meng, Mingji Liu, Tong Li, Desheng Xue	New soft magnetic materials ($Y_{1-x}Sm_x)_2Fe_{14}B$ with tunable magnetic anisotropy	ACTA materialia	薛德胜
摘要	Soft magnetic materials play important roles in both power generation and conversion devices with the rapid development of power semiconductors, however, finding new soft magnetic materials is an urgent problem. It was found that ($Y_{1-x}Sm_x)_2Fe_{14}B$ ($0 \le x \le 1$) compounds prepared by vacuum induction melting have a tetragonal structure.In ($0 \le x \le 1$) range, the saturation magnetization is higher than 110 Am^2 /kg, the Curie temperature is over 290 ℃, the coercivity and the remanence are less than 5729.8 A m^{-1} and 7 A m^2 /kg, respectively. Furthermore, with increasing x the directions of easy magnetization change from the c -axis (x = 0 . 00) to the cone plane (x = 0 . 15), and then to the ab -plane ($x \ge 0$. 30). For x = 0 . 15 compound, the permeability at 100 kHz is 11.8, that is beyond all of existing rare earth magnetic materials. These indicate that ($Y_{1-x}Sm_x)_2Fe_{14}B$ compounds are the promising candidate for proper soft magnetic materials without x = 0. Our work extends the function of rare earth transition metal intermetallic compounds, which open a new way to find advanced soft magnetic materials.			

序号	所有作者	题目	期刊名（Source Title）	联系人
139	Mengjing Jin, Guowen Sun, Yanting Wang, Junsheng Yuan, Haixing Zhao, Gang Wang, Jinyuan Zhou, Erqing Xie, and Xiaojun Pan	Boosting Charge Transport and Catalytic Performance in MoS_2 by Zn^{2+} Intercalation Engineering for Lithium−Sulfur Batteries	ACS NANO	潘孝军
摘要	Transition metal dichalcogenides (TMDs) have been widely studied as catalysts for lithium-sulfur batteries due to their good catalytic properties. However, their poor electronic conductivity leads to slow sulfur reduction reactions. Herein, a simple Zn^{2+} intercalation strategy was proposed to promote the phase transition from semiconducting 2H-phase to metallic 1T-phase of MoS_2. Furthermore, the Zn^{2+} between layers can expand the interlayer spacing of MoS_2 and serve as a charge transfer bridge to promote longitudinal transport along the c-axis of electrons. DFT calculations further prove that Zn-MoS_2 possesses better charge transfer ability and stronger adsorption capacity. At the same time, Zn-MoS_2 exhibits excellent redox electrocatalytic performance for the conversion and decomposition of polysulfides. As expected, the lithium-sulfur battery using $Zn_{0.12}MoS_2$-carbon nanofibers (CNFs) as the cathode has high specific capacity (1325 mAh g^{-1} at 0.1 C), excellent rate performance (698 mAh g^{-1} at 3 C), and outstanding cycle performance (it remains 604 mAh g^{-1} after 700 cycles with a decay rate of 0.045% per cycle). This study provides valuable insights for improving electrocatalytic performance of lithium-sulfur batteries.			
140	Huiliang Wu, Qingfang Liu,* Runliang Gao, Shuai Mi, Lei Jia, Jianing Wang, Huibo Liu, Senfu Zhang, Jinwu Wei, Xiangqian Wang, Genliang Han, and Jianbo Wang*	Acoustic Wave-Induced FeRh Magnetic Phase Transition and Its Application in Antiferromagnetic Pattern Writing and Erasing	ACS Nano	刘青芳
摘要	We explore the FeRh magnetic phase transition (MPT) and magnetic phase domain (MPD) with the introduction of surface acoustic waves (SAWs). The effects of the SAW pulses with different pulse widths and powers on resistance-temperature loops are investigated, revealing that the SAW can reduce the thermal hysteresis. Meanwhile, the SAW-induced comb-like antiferromagnetic (AFM) phase domains are observed. By changing the pulse width and SAW frequency, we further realize a writing-erasing process of the different comb-like AFM phase domains in the mixed-phase regime of the cooling transition branch. Resistance measurements also display the repeated SAW writing-erasing and the nonvolatile characteristic clearly. MPT paths are measured to demonstrate that short SAW pulses induce isothermal MPT and write magnetic phase patterns via the dynamic strain, whereas long SAW pulses erase patterns via the acoustothermal effect. The Preisach model is introduced to model the FeRh MPT under the SAW pulses, and the calculated results correspond well with our experiments, which reveals the SAW-induced energy modulation promotes FeRh MPT. COMSOL simulations of the SAW strain field also support our results. Our study not only can be used to reduce the thermal hysteresis but also extends the application of the SAW as a tool to write and erase AFM patterns for spintronics and magnonics.			
141	Qiyuan Wu， Fengfeng Li， Hongwei Sheng, Yifeng Qi, Jiao Yuan, Huasheng Bi, Wenquan Li, Erqing Xie, and Wei Lan	In Situ Fabrication of Hierarchical CuO@CoNi-LDH Composite Structures for High-Performance Supercapacitors	ACS APPLIED MATERIALS&INTERFACES	兰伟
摘要	Layered double hydroxide (LDH) materials, despite their high theoretical capacity, exhibit significant performance degradation with increasing load due to their low conductivity. Simultaneously achieving both high capacity and high rate performance is challenging. Herein, we fabricated vertically aligned CuO nanowires in situ on the copper foam (CF) substrate by alkali-etching combined with the annealing process. Using this as a skeleton, electrochemical deposition technology was used to grow the amorphous alpha-phase CoNi-LDH nanosheets on its surface. Thanks to the high specific surface area of the CuO skeleton, ultrahigh loading (16.36 mg cm^{-2}) was obtained in the fabricated CF/CuO@CoNi-LDH electrode with the cactus-like hierarchical structure, which enhanced the charge transfer and ion diffusion dynamics. The CF/CuO@CoNi-LDH electrode achieved a good combination of high areal capacitance (33.5 F cm^{-2}) and high rate performance (61% capacitance retention as the current density increases 50 times). The assembled asymmetric supercapacitor device demonstrated a maximum potential window of 0-1.6 V and an energy density of 1.7 mWh cm^{-2} at a power density of 4 mW cm^{-2}. This work provides a feasible strategy for the design and fabrication of high-mass-loading LDH composites for electrochemical energy storage applications.			
142	Li Ruixia, Wang Qiao, Wang Yanrong*, An Beixi, Yang Yifan, Wu Zhengkun, Zhang Tingyu, Han Ruiqi, Xie Erqing.	Unraveling the Effect of Oxygen Vacancy on WO_3 Surface for Efficient NO_2 Detection at Low Temperature	ACS Applied Materials Interface	谢二庆
摘要	Oxygen vacancies (V_O) in metal oxide semiconductors play an important role in improving gas-sensing performance of chemiresistive gas sensors. Nonetheless, there is still a lack of clear understanding of the inherent mechanism of the influence of oxygen vacancies on gas sensing due to generally focusing on the concentration of V_O. Herein, oxygen vacancies were rationally modulated in WO_3 nanoflower structures via an annealing process, resulting in a transformation of V_O from neutral (V_O^0) to a doubly ionized (V_O^{2+}) state. Density functional theory (DFT) calculations indicate that V_O^{2+} is significantly more efficient than V_O^0 for NO_2 detection in competition with atmospheric O_2. Benefiting from a high concentration of V_O^{2+}, the WO_3-450 (WO_3 annealed at 450 °C) sensor exhibits excellent sensing performance with an ultrahigh sensitivity (3674.1 to 5 ppm NO_2), superior selectivity, and long-term stability (one month). Furthermore, the sensor with the wide range of concentration detection not only can detect NO_2 gas with parts per million (ppm) but also can detect NO_2 with parts per billion (ppb) level concentration, with a high sensibility reaching 2.8 to 25 ppb NO_2 and over 100 to 100 ppb NO_2. This study elucidates the oxygen vacancy mediated sensing mechanism toward NO_2 and provides an effective strategy for the rational design of gas sensors with high sensing performance.			

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序号	所有作者	题目	期刊名（Source Title）	联系人
143	Fu-Lai Wang, Xiang Liu	Surveying the mass spectra and the electromagnetic properties of the $\Xi_c^{(\prime,*)}D^{(*)}$ molecular pentaquarks	PHYSICAL REVIEW D	刘翔
摘要	Motivated by the observed $P_{\psi s}^{\Lambda}(4459)/P_{\psi s}^{\Lambda}(4338)$ and $T_{cc}(3875)^+$ states as the $\Xi_c\overline{D}^*/\Xi_c\overline{D}$ and DD^* molecular candidates, respectively, in this work we investigate the $\Xi_c^{(\prime,*)}D^{(*)}$ molecular systems. We obtain the mass spectra and the corresponding spatial wave functions of the $\Xi_c^{(\prime,*)}D^{(*)}$-type double-charm molecular pentaquark candidates with single strangeness, where we utilize the one-boson-exchange model and take into account both the S-D wave-mixing effect and the coupled-channel effect. Our results show that the most promising candidates of the double-charm molecular pentaquarks with single strangeness include the Ξ_cD state with $I(J^P)=0(1/2^-)$, the $\Xi_c'D$ state with $I(J^P)=0(1/2^-)$, the Ξ_cD^* tates with $I(J^P)=0(1/2^-,3/2^-)$, the $\Xi_c'D^*$ state with $I(J^P)=0(3/2^-)$, the Ξ_cD^* states with $I(J^P)=0(1/2^-,3/2^-)$, and the $\Xi_c^*D^*$ states with $I(J^P)=0(1/2^-,3/2^-,5/2^-)$. To gain further insight into the inner structures and the properties of the isoscalar $\Xi_c^{(\prime,*)}D^{(*)}$ thorn molecular candidates, we utilize the constituent quark model to analyze their M1 radiative decay behaviors and magnetic moments based on the obtained mass spectra and spatial wave functions, which can offer significant information to determine their spin-parity quantum numbers and configurations in the forthcoming experiments. We suggest that our experimental colleagues search for the predicted $\Xi_c^{(\prime,*)}D^{(*)}$ molecular states.		
144	Jiong-Jiong Liu, Zhan-Wei Liu, Kan Chen, Dan Guo, Derek B. Leinweber, Xiang Liu, Anthony W. Thomas	Structure of the Λ(1670) resonance	PHYSICAL REVIEW D	刘占伟
摘要	We examine the internal structure of the $\Lambda(1670)$ through an analysis of lattice QCD simulations and experimental data within Hamiltonian effective field theory. Two scenarios are presented. The first describes the $\Lambda(1670)$ as a bare three-quark basis state, which mixes with the $\pi\Sigma$, $\overline{K}N$, $\eta\Lambda$ and $K\Xi$ mesonbaryon channels. In the second scenario, the $\Lambda(1670)$ is dynamically generated from these isospin-0 coupled channels. The K^-p scattering data and the pole structures of the $\Lambda(1405)$ and the $\Lambda(1670)$ can be simultaneously described well in both scenarios. However, a comparison of the finite -volume spectra to lattice QCD calculations reveals significant differences between these scenarios, with a clear preference for the first case. Thus the lattice QCD results play a crucial role in allowing us to distinguish between these two scenarios for the internal structure of the $\Lambda(1670)$.		
145	Bao-Jun Lai, Fu-Lai Wang, Xiang Liu	Investigating the M1 radiative decay behaviors and the magnetic moments of the predicted triple-charm molecular-type pentaquarks	PHYSICAL REVIEW D	刘翔
摘要	In this work, we systematically study the electromagnetic properties including the M1 radiative decay widths and the magnetic moments of the isoscalar $\Xi_{cc}D^{(*)}$, $\Xi_{cc}D_1$, and $\Xi_{cc}D_2^*$ triple-charm molecular-type pentaquark candidates, where we adopt the constituent quark model and consider both the S-D wave mixing effect and the coupled channel effect. Our numerical results suggest that the M1 radiative decay widths and the magnetic moments of the isoscalar $\Xi_{cc}D^{(*)}$, $\Xi_{cc}D_1$, and $\Xi_{cc}D_2^*$ triple-charm molecular-type pentaquark candidates can reflect their inner structures, and the study of the electromagnetic properties is an important step to construct the family of the triple-charm molecular-type pentaquarks. With the accumulation of the experimental data during the high-luminosity phase of LHC, we expect that the present work combined with the corresponding mass spectrum information can encourage the experimental colleagues at LHCb to focus on the isoscalar $\Xi_{cc}D^{(*)}$, $\Xi_{cc}D_1$, and $\Xi_{cc}D_2^*$ triple-charm molecular-type pentaquark candidates.		

序号	所有作者	题目	期刊名（Source Title）	联系人
146	Ping Chen, Zhan-Wei Liu, Zi-Le Zhang, Si-Qiang Luo, Fu-Lai Wang, Jun-Zhang Wang, Xiang Liu	Role of electromagnetic interactions in the $X(3872)$ and its analogs	PHYSICAL REVIEW D	刘占伟
摘要	We investigate the role of the electromagnetic interaction in the formation and decay of the $X(3872)$. The binding properties of the $X(3872)$ are studied by assuming the molecular nature and considering the S-D wave mixing, isospin breaking, and coupled channel effects, and in particular the correction from the electromagnetic interaction. The radiative decays can better reflect the difference between the charged and neutral $D\overline{D}^*$ components, since the electromagnetic interaction explicitly breaks the isospin symmetry. We further study the radiative decay widths with the obtained wave functions for different $D\overline{D}^*$ channels. We also explore other similar hidden-charm molecular states. The electromagnetic interaction can make the molecule tighter. Our result of the radiative decay width for $X(3872)\to\gamma J/\psi$ is in agreement with the experiment. The branching ratio $R_{\gamma\psi}$ is less than 1 in our framework, which supports the Belle and BESIII measurements.		
147	Tian-Cai Peng, Zi-Yue Bai, Jun-Zhang Wang, Xiang Liu	How higher charmonia shape the puzzling data of the $e^+e^-\to\eta J/\psi$ cross section	PHYSICAL REVIEW D	刘翔
摘要	Recently, the BESIII collaboration performed a precise measurement of the $e^+e^-\to\eta J/\psi$ cross section. It is puzzling that the resonance parameters of the reported $Y(4230)$ show a substantial divergence from the previously measured results in both the open -charmed and hidden -charmed decay channels, and the line shape asymmetry of the data approaching 4.2 GeV also suggests that it might be difficult to characterize the details of the structure around 4.2 GeV by a single resonance. This has motivated our great curiosity about how the charmonium states are distributed in the measured energy range and how they shape the puzzling data of the $e^+e^-\to\eta J/\psi$ cross section. In this work, we use five theoretically constructed charmonia in the range of 4.0 -4.5 GeV, i.e., ψ(4040), ψ(4160), ψ(4220), ψ(4380), and ψ(4415), to apply a combined fit to the data, in which their calculated decay ratios into $\eta J/\psi$ via hadronic loop mechanism are taken as input. The fit results can reproduce the measured cross section data well, especially for the subtle line shape around 4.2 GeV, showing that the structure around 4.2 GeV is possible from the contribution of both ψ(4160) and ψ(4220).		
148	Zhi-Peng Wang, Fu-Lai Wang, Guang-Juan Wang, Xiang Liu	Probing exotic J^{PC} resonances from deeply bound charmoniumlike molecules: Insights for identifying exotic hadrons	PHYSICAL REVIEW D	刘翔
摘要	We investigate the resonance phenomenon in deeply bound charmoniumlike states. By interpreting the $Y(4220)$, $Y(4360)$, and ψ(4415) states as deeply S-wave bound $D\overline{D}_1$, $D^*\overline{D}_1$, and $D^*\overline{D}_2^*$ molecules, respectively, we robustly predict the existence of 4 S-wave deeply bound C-parity partner states and 13 P-wave charmoniumlike molecular resonances. These states, formed by exchanging the light mesons and pinpointed through the complex scaling method, include 3 S-wave bound states with exotic quantum numbers $I(J^{PC})=0(1^{-+})$ and 5 P-wave resonances with exotic $0(0^{-+})$ and $0(2^{+-})$. We expect future experiments to search for such exotic molecular resonances, which will not only enrich the ongoing construction of "Particle Zoo 2.0" but also help to scrutinize the hadronic molecular assignments of the Y- family particles including the $Y(4220)$, $Y(4360)$, and ψ(4415) states.		

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序号	所有作者	题目	期刊名 (Source Title)	联系人
149	Zhong-Yu Wang, Chu-Wen Xiao, Zhi-Feng Sun, Xiang Liu	Possible molecules of triple-heavy pentaquarks within the extended local hidden gauge formalism	PHYSICAL REVIEW D	刘翔
摘要	In this study, we explore the interactions between mesons and baryons in the open heavy sectors to identify potential triple-heavy molecular pentaquarks. We derive the meson-baryon interaction potentials using the vector meson exchange mechanism within the extended local hidden gauge formalism. The scattering amplitudes are computed by solving the coupled-channel Bethe-Salpeter equation, revealing several bound systems. By analyzing the poles of these amplitudes in the complex plane, we determine the masses and widths of these bound states. Additionally, we evaluate the couplings and compositeness of different channels within each bound system to assess their molecular characteristics. Our predictions include 4 Ω_{ccc}-like states, 4 Ω_{bbb}-like states, 14 Ω_{bcc}-like states, and 10 Ω_{bbc}-like states, which could be targets for future experimental investigations.			
150	Cheng-Xi Liu, Li-Ming Wang, Ting-Yan Li, Xiang Liu	Likelihood analysis of the newly observed $f_0(2020)$, $f_0(2330)$, and $f_0(2470)$ in $J/\psi \to \gamma\eta'\eta'$ as high-lying unflavored scalar mesons	PHYSICAL REVIEW D	刘翔
摘要	Inspired by the newly observed three scalar states $f_0(2020)$, $f_0(2330)$, and $f_0(2470)$ by the BESIII collaboration in $J/\psi \to \gamma\eta'\eta'$, we carried out the study of spectroscopic behavior of these high-lying unflavored scalar mesonic states. In this work, using the phenomenological description of radial (n, M^2) trajectory and the quark pair creation model, we discussed the assignments of the $f_0(2020)$, $f_0(2330)$, and $f_0(2470)$ associated with the $f_0(2200)$ as the isoscalar high-lying scalar mesonic states and predicted the spectroscopic properties of their high-lying partners. The present study may provide valuable information for the construction of the scalar meson family.			
151	Yu-Xin Peng, Si-Qiang Luo, Xiang Liu	Refining radiative decay studies in singly heavy baryons	PHYSICAL REVIEW D	刘翔
摘要	In this work, we systematically study the radiative decays of singly heavy baryons, a crucial aspect of their spectroscopic behavior. To enhance the accuracy of our calculations, we utilize numerical spatial wave functions for the singly heavy baryons obtained through the Gaussian expansion method, which also yields their mass spectrum. As hadron spectroscopy enters an era of high precision, we believe our study of the radiative decays of singly heavy baryons will provide valuable insights for further exploration of these particles.			
152	Wei He, De-Shun Zhang, Zhi-Feng Sun	Z_b states as the mixture of the molecular and diquark-anti-diquark components within the effective field theory	PHYSICAL REVIEW D	孙志峰
摘要	In this study, we reconsider the states $Z_b(10610)$ and $Z_b(10650)$ by investigating the presence of diquark-anti-diquark components as well as the hadronic molecule components in the framework of effective field theory. The different masses of pseudoscalar mesons such as π^0, η_8, and η_0, as well as vector mesons like ρ^0 and ω violate the Okubo-Zweig-Iizuka (OZI) rule that is well depicted under the $[U(3)_L \otimes U(3)_R]_{\text{global}} \otimes [U(3)_V]_{\text{local}}$ symmetry. To account for the contribution of intermediate bosons of heavy masses within the one-boson-exchange model, we introduce an exponential form factor instead of the commonly used monopole form factor in the past. By solving the coupled-channel Schrödinger equation with the Gaussian expansion method, our numerical results indicate that the $Z_b(10610)$ and $Z_b(10650)$ states can be explained as hadronic molecules slightly mixing with diquark-anti-diquark states.			

序号	所有作者	题目	期刊名 (Source Title)	联系人
153	Zhi-Feng Sun, Ning Li, Xiang Liu	Isospin violation effect and three-body decays of the T_{cc}^+ state	PHYSICAL REVIEW D	孙志峰
摘要	In this work, we make a study of the T_{cc}^+ state observed by the LHCb collaboration in 2021. In obtaining the effective potentials using the one-boson-exchange potential model we use an exponential form factor and find that, in the short and medium range, the contributions of the π, ρ, and ω exchanges are comparable while in the long range the pion-exchange contribution is dominant. Based on the assumption that T_{cc} is a loosely bound state of D^*D, we focus on its three-body decay using the meson-exchange method. Considering that the difference between the thresholds of $D^{*+}D^0$ and $D^{*0}D^+$ is even larger than the binding energy of T_{cc}^+, the isospin-breaking effect is amplified by the small binding energy of T_{cc}^+. Explicitly including such an isospinbreaking effect we obtain, by solving the Schrödinger equation, that the probability of the isoscalar component is about 91% while that of the isovector component is around 9% for T_{cc}^+. Using the experimental value of the mass of T_{cc}^+ as an input, we obtain the wave function of T_{cc}^+ and further obtain its width via the three-body hadronic as well as the radiative decays. The total width we obtain is in agreement with the experimental value of the LHCb measurement with a unitarized Breit-Wigner profile. Conversely, the current results support the conclusion that T_{cc}^+ is a hadronic molecule of D^*D.			
154	Zi-Le Zhang, Zhan-Wei Liu, Si-Qiang Luo, Ping Chen, Zhi-Hui Guo	Masses and radiative decay widths of $D_{s0}^*(2317)$ and $D_{s1}^{'}(2460)$ and their bottom analogs	PHYSICAL REVIEW D	刘占伟
摘要	We study the mass spectra and radiative decays of $D_{s0}^*(2317)$ and $D_{s1}^{'}(2460)$ in an unquenched framework. In addition to coupled channel effects between the $c\bar{s}$ cores and $D^{(*)}K$ channels, $D^{(*)}K$-$D^{(*)}K$ self-interactions are also considered in this work and we succeed to reproduce their mass spectra. Furthermore, we study the radiative decays of the $D_{s0}^*(2317)$ and $D_{s1}^{'}(2460)$ by simultaneously including the compound structures of conventional $c\bar{s}$ cores and $D^{(*)}K$ components. We also calculate their bottom analogs with heavy quark symmetry. Our study offers useful insights into the important unquenched effects in the formation of $D_{s0}^*(2317)$, $D_{s1}^{'}(2460)$, and the bottom counterparts.			
155	Yu Zhuge, Zhan-Wei Liu, Derek B. Leinweber, Anthony W. Thomas	Pion photoproduction of nucleon excited states with Hamiltonian effective field theory	PHYSICAL REVIEW D	刘占伟
摘要	We refine our previous calculation of multipole amplitude E_{0-} for pion photoproduction process, $\gamma N \to \pi N$. The treatment of final-state interactions is based upon an earlier analysis of pion-nucleon scattering within Hamiltonian effective field theory, supplemented by incorporating contributions from the $N^*(1650)$ and the $K\Lambda$ coupled channel. The contribution from the bare state corresponding to the $N^*(1650)$ significantly enhances our results. Additionally, we also compute the multipole amplitude M_{1-}, which is of direct relevance to the Roper resonance. The results are comparable with other dynamical coupled-channel models, even though the contribution from the bare state (interpreted as a $2s$ excitation) in this channel is small because of its large mass.			
156	Fu-Lai Wang, Si-Qiang Luo, Ri-Qing Qian, Xiang Liu	Spectroscopic properties of double-strangeness molecular tetraquarks	PHYSICAL REVIEW D	刘翔
摘要	Inspired by recent advances in the study of the $K^{(*)}\overline{K}^{(*)}$ molecular tetraquarks and the H-dibaryon, we focus on the spectroscopic properties of the $\overline{K}^{(*)}\overline{K}^{(*)}$ systems, which exhibit an exotic flavor quantum number of $ss\bar{q}\bar{q}$. A dynamical analysis is performed using the one-boson-exchange model to describe the effective interactions for these systems, accounting for both S-D wave mixing and coupled-channel effects. By solving the coupled-channel Schrodinger equation, we identify the $I(J^P) = 0(1^+)\overline{K}\overline{K}^*$ and $I(J^P) = 0(1^+)\overline{K}^*\overline{K}^*$ states as the most likely candidates for double-strangeness molecular tetraquarks. Furthermore, we estimate their strong decay behaviors based on the effective Lagrangian approach, with several channels exhibiting considerable decay widths. Meanwhile, we investigate their magnetic moments and M1 radiative decay widths, shedding light on their inner structures, within the constituent quark model. Finally, we encourage experimentalists to focus on these predicted double-strangeness molecular tetraquark candidates, particularly in B meson decays. Such efforts could pave the way for establishing the molecular tetraquark states in the light-quark sector.			

专利列表

序号	专利名称	全部发明人	专利号	授权年度	专利类型
1	一种超声喷雾热解旋转镀膜机及其镀膜方法	张泽民、余凯	ZL 202211021612.X	2024	发明专利
2	一种新型多功能光电化学反应池	张泽民、孙萌迪、刘博	ZL 202110111365.1	2024	发明专利
3	基于沟道隐埋层的电流可控型静电感应晶体管	杨建红、王欣、陈健、肖彤、王娇乔坚栗	ZL 201610847814.8	2024	发明专利
4	一种复合电极材料的制备方法、超级电容器及电池	兰伟、邵明娇、盛鸿伟	ZL 202210852203.8	2024	发明专利
5	一种针对三线镰刀菌的纳米铁抗菌剂	吴志国、何跳娥、赵毅、祝英闫鹏勋、侯应国、李文渊	ZL 202211102339.3	2024	发明专利
6	一种18H六角铁氧体的化学共沉淀制备方法	何东霖、王涛、刘露	ZL 202311252044.9	2024	发明专利
7	一种基于ESP-NOW协议的无线开关窗控制器	李训栓、任彬	ZL 202420836888.1	2024	实用新型
8	金属氧化物基电容式离子二极管及其制备方法和应用	兰伟、马鸿云	ZL 202310217053.8	2024	发明专利
9	可植入电容式离子二极管及其制备方法和应用	兰伟、马鸿云	ZL 202310217033.0	2024	发明专利
10	一种区分碳化硅中贯穿螺型位错和贯穿刃型位错的方法	赵桂娟、茆邦耀、王兴梁、吕秀睿	ZL 202310608691.2	2024	发明专利
11	一种Buck电路	赵桂娟、任彬	ZL 202323351613.3	2024	实用新型
12	一种GaN HEMT器件模型的建模方法	刘贵鹏、周子维、赵桂娟	ZL 202410269625.1	2024	发明专利

07 学生工作
STUDENT WORK

一、加强思想引领，提升党建质量

坚持不懈用习近平新时代中国特色社会主义思想凝心铸魂，全方位贯彻落实立德树人各项任务。围绕重要节点开展理想信念、爱国主义和思想道德教育。举办书记、院长开学“第一课”、党委委员师生共话活动。深入学习党的二十届三中全会、政府工作报告等内容。邀请学校领导、马克思主义学院教师为学生讲授专题党课。组织学生党员和入党积极分子赴红色教育基地开展党性教育。举办理论宣讲微党课比赛。推动党支部共建、党建带团建、班团一体化建设。加大在低年级本科生发展党员力度，举办新生入党启蒙教育。学院荣获兰州大学微党课大赛三等奖及优秀组织单位。



● 范宝军副校长为本科生讲授专题党课



● 党委书记吴国军与本科生座谈



● 举办学生体育工作总结表彰大会



● 前往天庆博物馆开展主题党日活动



● 院长刘翔为2021级本科生做院史院情报告



● 开展新生入党启蒙教育



● 2024级本科新生圆满完成军训任务



- 本科新生参观校史馆、博物馆



- 本科生党支部开展烈士陵园祭扫主题党日活动



- 学院习近平新时代中国特色社会主义思想学习兴趣小组分享交流学习心得



- 学院团委举办校级示范性主题团日活动



● 开展理想信念教育活动



● 学习两会精神



● 召开第五次研究生代表大会



● 举办理论宣讲微党课比赛



● 参加十一升旗仪式



● 参加纪念“一二·九”运动长跑活动

二、细化教育管理，增强育人实效

加强榜样引领，举办开学、毕业、表彰“三大典礼”。发挥资助育人作用，评定本科生奖助学金200余万元、研究生奖助学金550余万元。加强日常安全教育，常态化开展防范电信诈骗活动。开展国家安全、法治、宗教等主题教育。开展“学术规范与学术道德”教育。制定《物理学院学生宿舍网格化管理方案》，构建宿舍育人管理模式。制定《物理学院研究生课题组信息员制度》，强化安全稳定网格化管理效能。细化学生心理健康台账，对重点关注学生进行及时有效的帮扶。学院荣获兰州大学第七届心理情景剧大赛一等奖。



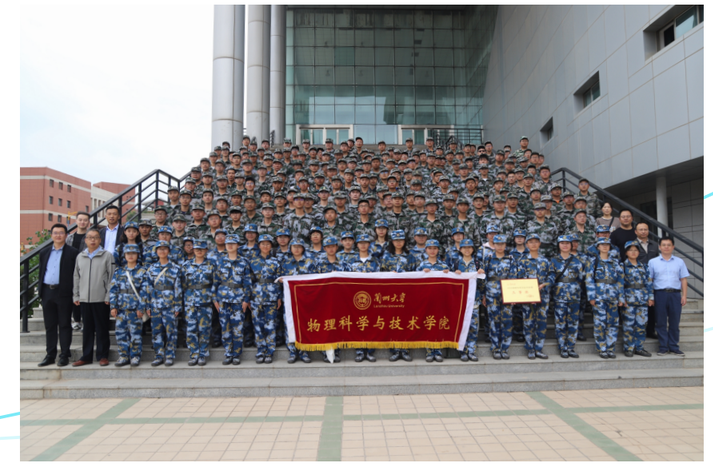
荣获兰州大学第七届心理情景剧大赛一等奖



举办2024届本科生毕业典礼



举办2024级本科生迎新大会



学院领导慰问参加军训的2024级本科新生

举办研究生毕业联欢晚会





举办研究生迎新典礼



举办防范电信诈骗专题讲座



召开2022级、2023级本科生年级大会



参观校史馆、院史馆

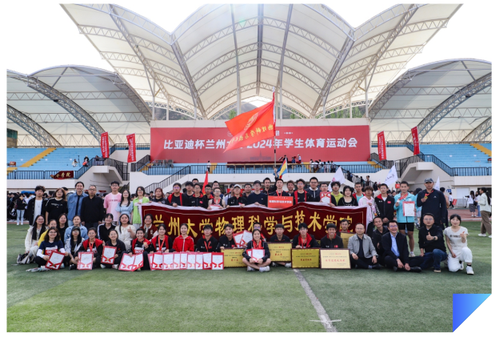


参加国家安全教育日宣传教育活动

三、强化综合素质，助推全面发展

开展研究生分组学术会议活动，加强学术交流，提升科研素养。建立以志愿服务为主渠道，以实验室、宿舍、自习室为主阵地的劳育教育模式。举办摄影技巧培训、毕业联欢会等文艺活动，加强美育教育。以田径队、游泳队、三大球、三小球8支学生体育运动队为骨干，举办各类体育活动和比赛，加强体育教育。立项国创13项、校创99项、碧政学者1项。学院荣获兰州大学2024年学生体育运动会团体总分第二名、“研途有你”师生趣味运动会团体总分第一名、新生文艺汇演优秀组织奖。学院本科生荣获第五届全国高校计算机能力挑战赛本研组决赛一等奖、第十届全国大学生物理实验竞赛（创新）决赛三项一等奖。





学院获2024年兰州大学学生体育运动会团体总分第二名



参加兰州大学啦啦操大赛



蝉联兰州大学排球联赛男子组冠军



获兰州大学羽毛球混合团体赛第五名

在兰州大学乒乓球联赛中获得佳绩





获兰州大学五人制足球联赛第五名

本科生参加新生文艺汇演比赛









在兰州大学游泳比赛中获得佳绩



参加乒乓球比赛



参加趣味运动会拔河比赛



● 第十届研究生羽毛球联赛



● 2024年春季师生运动会



● 研究生骨干培训会



● 青春不散羽毛球友谊赛



● 第二届“格致杯”羽毛球赛



● 第三届“物理杯”师生篮球赛



● 研究生“骆驼杯”排球赛物理外语联队



● 研究生摄影技巧培训

四、加强过程指导，促进高质量就业

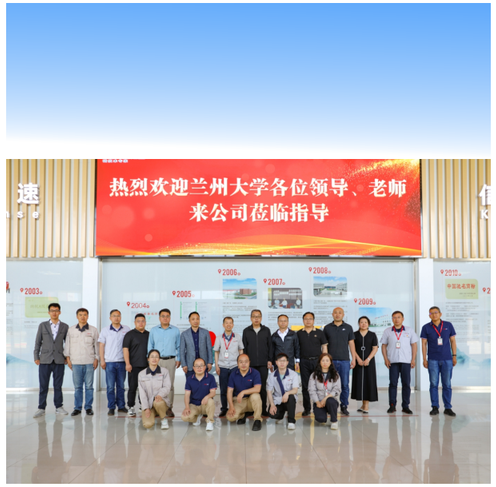
举办就业形势、行业知识、简历制作、求职法律知识等系列讲座和培训，开设学院“简历门诊”。制定《物理学院职业生涯规划课程建设方案》，将生涯教育贯穿学生培养全过程。落实“访企拓岗”促就业专项行动计划，班子成员、学科带头人走访企业共计31家。积极拓展就业资源，加强就业信息的整合和定向推送。对毕业未就业学生施行“一人一策”，做到工作不断档、服务不断线。



组织本科生前往天水有关企业实习实践



走访安徽大地熊新材料股份有限公司



走访沈阳隆基电磁科技股份有限公司



学生前往广州奥迪威传感科技有限公司实习实践



与成都芯正微电子科技股份有限公司开展洽谈合作



与沈阳隆基电磁科技股份有限公司开展洽谈合作



● 获第二届全国大学生职业规划大赛兰州大学校赛一、二等奖及优秀组织奖



● 简历制作与指导讲座



● 就业宣讲会



● 就业动员大会



● 就业动员大会



荣誉奖项
第十届全国大学生物理实验竞赛（创新）三项全国一等奖
第七届全国大学生嵌入式芯片与系统设计竞赛全国二等奖
全国大学生数字媒体科技作品及创意竞赛一等奖
“研途有你”师生趣味运动会团体总分第一名
兰州大学2024年学生体育运动会团体总分第二名
兰州大学2024年拔河比赛冠军
兰州大学2024年排球联赛男子冠军
兰州大学第七届心理情景剧大赛一等奖
兰州大学2024年游泳比赛团体总分第二名



08

交流合作
EXCHANGE AND COOPERATION

学术交流

全年共接待来校做学术报告人员 **166** 人次

举办国内、国际学术会议 **10** 余场

接待外宾 **35** 人

举办格致论坛 **85** 场

专家报告

杜江峰

7月27日，浙江大学杜江峰教授做题为“单自旋量子调控及前沿应用”的报告



Jul.27

房双世

1月29日，中国科学院高能物理研究所房双世研究员做题为“北京谱仪上轻强子物理研究”的报告



Jan.29

王 磊

3月6日，中国科学院物理研究所王磊研究员做题为“Generative AI in Science”的报告



Mar.06

刘 杰

3月7日，中国工程物理研究院刘杰 教授做题为“从光电效应到阿秒物理”的报告



Mar.07

专家报告

傅立斌

3月11日，中国工程物理研究院傅立斌研究员做题为“阿秒与强场半经典模型”的报告

Mar.11



王小平

3月22日，北京航空航天大学王小平副教授做题为“Searching for ALP DM in Alkali-Noble-Gas Haloscopes”的报告

Mar.22



廖 恺

4月13日，武汉大学廖恺教授做题为“瞬变源强引力透镜简介”的报告

Apr.13



祁 楠

5月25日，中国科学院半导体研究所祁楠研究员做题为“高性能计算Chiplet光接口芯片”的报告

May.25



刘 佳

3月22日，北京大学物理学院刘佳研究员做题为“Dark Photon Dark Matter Detection with Radio Telescopes”的报告

Mar.22



谢卫强

5月27日，上海交通大学谢卫强副教授做题为“薄膜砷化镓铝集成非线性光子及其应用”的报告

Apr.27



吴 飙

3月28日，北京大学吴飙教授做题为“Quantum Dynamics: Chaos and Ergodicity”的报告

Mar.28



郑子剑

4月1日，香港理工大学郑子剑教授做题为“柔性透气电子：材料器件能源”的报告

Apr.01



张 永

5月27日，上海交通大学张永研究员做题为“高速低功耗光电子异质集成器件”的报告

Apr.27



吴 昊

5月27日，松山湖材料实验室吴昊研究员做题为“基于量子材料的自旋存储器件探索”的报告

Apr.27



专家报告

张　靖



6月3日，山西大学张靖教授做题为“超冷原子中实验实现双层扭转光晶格”的报告

Jun. 03

于海明



6月3日，北京航空航天大学于海明教授做题为“磁性纳米结构中的强磁振子耦合和单向交换自旋波”的报告

Jun.03

刘艺舟



7月2日，中国科学院合肥物质科学研究院刘艺舟研究员做题为“三维拓扑磁结构-磁霍普夫子的层展电磁响应”的报告

Jul.02

于　涛



7月12日，华中科技大学于涛教授做题为“自旋辐射效应：驱动磁子、电子、激子、声子自旋流的有效方式”的报告

Jul. 12

邵定夫



6月19日，中国科学院合肥物质科学研究院邵定夫研究员做题为“基于奈尔自旋流的反铁磁自旋电子学”的报告

Jun. 19

纪幸辰



7月10日，上海交通大学纪幸辰副教授做题为“超低损耗氮化硅集成光子芯片：制备、表征与应用”的报告

Jul.10

朱礼军



6月25日，中国科学院半导体研究所朱礼军研究员做题为“垂直磁矩的自旋轨道矩翻转”的报告

Jun.25

顾　波



7月1日，中国科学院大学顾波副教授做题为“高温铁磁半导体理论研究”的报告

Jul.01

周　磊



7月19日，复旦大学周磊教授做题为“Metasurfaces for controlling light”的报告

Jul. 19

刘　飞



7月19日，西安电子科技大学刘飞教授做题为“散射光场中信息复原的关键技术研究”的报告

Jul.19

专家报告

刘正猷

7月22日，武汉大学刘正猷教授做题为“声子晶体中的高阶拓扑物态”的报告

Jun. 22



宋　礼

8月7日，中国科学技术大学宋礼教授做题为“同步辐射探究电催化机理”的报告

Mug. 07



戴子高

8月22日，中国科学技术大学戴子高教授做题为“快速射电暴的起源、辐射和应用”的报告

Mug.22



王逸璞

8月30日，浙江大学王逸璞研究员做题为“非厄米腔磁子学”的报告

Mug. 30



蒋　昆

8月7日，复旦大学蒋昆研究员做题为“CO_2电还原反应中的原位谱学电化学和电解池器件研究”的报告

Mug. 07



穆晓柯

9月12日，兰州大学穆晓柯教授做题为“新4D-STEM方法同时成像材料的结构和磁畴”的报告

Sep.12



薛　飞

8月16日，合肥工业大学薛飞教授做题为“动态悬臂梁磁矩仪——零维微纳样品单体磁表征”的报告

Mug.16



李宝军

8月16日，暨南大学李宝军教授做题为“用于细胞操作和成像的活体纳米探针”的报告

Mug.16



常凌乾

10月12日，北京航空航天大学常凌乾教授做题为“纳米诊疗芯片”的报告

Oct.12



吴　镝

10月31日，南京大学吴镝教授做题为“Symmetry and ultrafast spin current”的报告

Oct.31



专家报告

肖 文



11月8日，浙江大学绍兴研究院肖文研究员做题为“先进封装技术：从摩尔到超摩尔的性能提升之路”的报告

Nov.08

成昭华



11月8日，中国科学院物理研究所成昭华研究员做题为“双拓扑绝缘体的量子输运、光激发和超快自旋动力学”的报告

Nov.08

周小红



12月30日，中国科学院近代物理研究所周小红研究员做题为“超重新元素及新核素合成”的报告

Dec.30

学术会议



◉ 5月25日，共同举办纪念徐躬耦先生学术思想研讨会



◉ 7月12日，举办The 2024 Belt and Road Symposium on Theoretical Physics

学术会议



◉ 7月16日，举办The 2024 Symposium on Quantum Chaos and Wave Chaos



◉ 7月22日，举办第八届全国热传导研讨会



◉ 8月4日，举办2024年青年学者论坛



◉ 8月9日，举办第二届面向未来的物理教育研讨会暨名家名师工作室工作会议



◉ 8月14日，举办2024年西南西北理论物理联合研讨会

学术会议



◉ 8月17日，举办第十三届全国光子学学术会议



◉ 11月24日，举办柔性电子与智慧健康交叉创新论坛国际学术会议



◉ 12月13日，举办2024年青年学者“黄河论坛”物理学院博士后论坛



◉ 12月19日，举办2024年青年研究员、博士后学术研讨暨年度汇报会

09

大事记
MEMORABILIA

4月

高大强、靳志文、刘玉孝、刘翔、魏少文、薛德胜6名教师入选2023年爱思唯尔“中国高被引学者”榜单

4月

举办全国大学生物理实验竞赛研讨会（西北地区）



5月

共同举办纪念徐躬耦先生学术思想研讨会



5月

靳志文教授荣获甘肃青年五四奖章



7月

举办第八届全国热传导研讨会



8月

兰伟教授获华为“难题揭榜”火花奖



8月

杜江峰院士来学院交流



8月

举办2024年西南西北理论物理联合研讨会



8月

举办第十三届全国光子学学术会议



8月

举办第二届面向未来的物理教育研讨会
暨名家名师工作室工作会议



9月

获批中国物理学会科普教育基地



9月

建成学院院史馆，上线院史馆VR云展厅



9月

魏少文教授荣获第十一届甘肃青年科技奖



9月

高大强、靳志文、兰伟、刘翔、刘玉孝、魏少文、薛德胜7位教授和应祖建研究员入选2024年度全球前2%顶尖科学家“年度科学影响力排行榜”榜单，高大强、刘翔、刘玉孝、魏少文、薛德胜5位教授入选“终身科学影响力排行榜”榜单

10月

师生翻译出版“物理科普简说译丛”



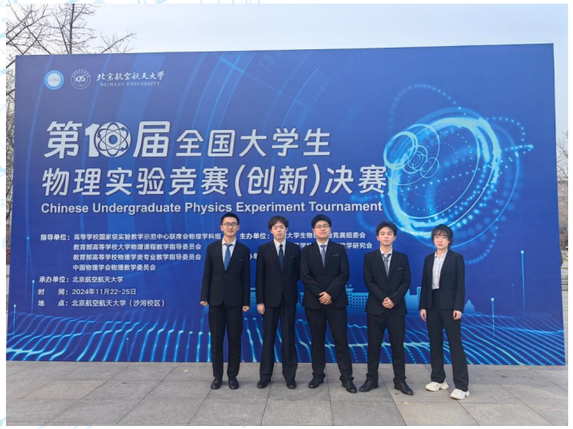
10月

召开本科教育教学迎评工作动员大会



11月

学子在第十届全国大学生物理实验竞赛（创新）决赛中荣获三项一等奖



11月

中国工程院院士、校长杨勇平来院调研指导工作



12月

举办2024年物理学院校友年会暨传感器行业校友论坛(安徽蚌埠)



12月

王雄飞、靳志文入选2024年甘肃省领军人才，田永辉入选第五批甘肃省飞天学者特聘教授，刘小晰教授、韩卫华教授入选2025年省级重点人才项目，张俊丽教授入选第三批陇原青年英才