



2015 年度重点实验室总结报告

重点实验室名称：纳米器件物理与化学教育部重点实验室

实验室主任：彭练矛

副主任：陈清 张锦

学术委员会主任：解思深

副主任：王占国 薛增泉 刘忠范

总结报告内容：

一、研究水平与贡献

本重点实验室 2003 年底验收成立，2012 年第二次通过教育部组织的实验室评估，被评为优秀。实验室自成立以来得到了科技部、基金委、教育部、北京市科委和北京大学的 985、211 等各专项的支持，围绕着纳米器件物理与化学相关领域开展研究，得到了很大的发展。自 2003 年实验室验收成立至 2015 年底，共发表以实验室为单位的 SCI 论文 730 篇，论文数目平稳上升，2015 年的年文章数首次超过了 100 篇，如下图所示。论文的引用也逐年增加，2015 年达到 3697 次/年。特别是，近几年每年都有在 Nature 子刊上发表的文章。





1. 本年度新增项目和合同经费数（万元）

2015 年实验室成员承担的科研项目有 53 项，总合同经费达到 1.3 亿多元；其中 2015 和 2016 年新启动的项目有 14 项，新增合同经费 3 千多万元。

特别是，近两年彭练矛教授领导的团队在碳纳米管器件方面的研究得到了北京市科委的大力支持。2014 年以彭练矛教授为首建立了碳基纳电子材料与器件北京市国际科技合作基地，入选第三批北京市国际科技合作基地（新材料领域）。

2. 本年度获奖情况（其中：国家级奖，省部级奖）

李彦教授的团队在 2015 年 10 月获得 2015 年中国分析测试协会科学技术奖（CAIA 奖）一等奖。

彭练矛教授荣获第四届首都科技盛典—推动“北京创造”的十大科技人物称号。

陈清教授被评为科学中国人 2014 年年度人物。

还有多位老师获得北京大学和信息科学技术学院的奖励。

实验室的学生们也获得了不少奖励：

李星同学获得中国真空学会 2015 年度真空科学硕士、博士优秀论文奖。

邱晨光，黄乐和夏华荣同学获得 2014-2015 学年度博士研究生国家奖学金。

宁志远同学 2015 年被授予北京市普通高等学校优秀毕业生的称号。

另有多位同学获得北京大学创新奖和入选信息科学技术学院的学术十杰。

3. 本年度发表论文数（其中：SCI，EI 论文数）

本年度实验室人员发表 SCI 论文有 102 篇，其中影响因子大于 6 的杂志上的有 60 篇（其中影响因子大于 10 的有 33 篇，分别是 Nat. Mater. 1 篇，Chem. Soc. Rev. 1 篇，Nat. Chem. 1 篇，Acc. Chem. Res. 1 篇，Adv. Mater. 2 篇，Nano. Lett. 5 篇，ACS Nano 4 篇，J. Am. Chem. Soc. 5 篇，Adv. Funct. Mater. 2 篇，Nat. Commun. 4 篇，Angew. Chem. Int. Ed. 1 篇，Nano Energy 5 篇，NPG Asia Mater. 1 篇）。

实验室骨干 2015 年在国际会议上做 3 次大会报告(Plenary talk)、30 余次邀请报告、和 20 次一般报告或墙报；在全国性重要学术会议上做 4 次大会报告(Plenary talk) 和 20 余次邀请报告。



4. 本年度申请及授权专利数

本年度实验室有 5 项中国国家发明专利申请获得授权，新申请了 6 项中国国家发明专利。

二、队伍建设与人才培养

1. 人才队伍情况：总人数，其中院士、长江学者、杰出青年人数，教授、副教授人数

本年度王永峰特聘研究员获得了国家自然科学基金优秀青年基金。

胡又凡特聘研究员入选中组部青年千人计划。

另外，全国优秀博士论文提名奖和北京市优秀博士论文获得者丁力博士 2015 年加入了本实验室。

到 2015 年底，实验室有 11 名正教授、3 位特聘研究员、12 名副教授或副研究员、2 名高工和 1 名讲师，共 31 位固定人员。学术骨干中有 3 位长江特聘教授、1 位千人计划特聘教授、4 位国家杰出青年获得者、2 位青年千人、1 位中组部拔尖人才、2 位优青、6 位教育部新世纪优秀人才、2 名北京大学百人计划特聘研究员。实验室成员在 20 余个重要学术机构中任职。

2. 人才培养情况：在站博士后、在读博士生、硕士生人数

本年度实验室有 11 名在站博士后；有在读博士生 70 余人，在读硕士生 40 余人。



数据和成果:

一、实验室固定成员名单

序号	姓名	性别	年龄	最后学位	称号	研究方向	技术职称	在实验室工作期限
1	彭练矛	男	53	博士	长江、杰青、百千万人才	纳米电子学	教授	2000 年至今
2	张锦	男	46	博士	长江、杰青、新世纪人才	纳米化学	教授	2002 年至今
3	陈清	女	50	博士	杰青、百千万人才、新世纪人才	纳米材料, 电子显微学	教授	2000 年至今
4	徐洪起	男	59	博士	中组部千人	量子结构 纳米电子学	教授	2010 年至今
5	李彦	女	49	博士	长江、杰青、新世纪人才	纳米材料化学	教授	2002 年至今
6	侯士敏	男	45	博士	新世纪人才	纳米电子学	教授	2000 年至今
7	张志勇	男	38	博士	拔尖、优青、新世纪人才	纳米电子学	教授	2008 年至今
8	张耿民	男	46	博士		物理电子学	教授	2000 年至今
9	梁学磊	男	41	博士		纳米电子学	教授	2003 年至今
10	许胜勇	男	49	博士		凝聚态物理	教授	2006 年至今
11	叶安培	男	55	博士		纳米生物 光子学	教授	2008 年至今
12	王永锋	男	36	博士	青千、优青	分子电子学	特聘研究员	2012 年至今
13	魏贤龙	男	33	博士	全国优博、北大百人	纳米材料表征和物性	特聘研究员	2012 年至今
14	胡又凡	女	36	博士	青千、北大百人	纳米电子学	特聘研究员	2014 年至今
15	王胜	男	38	博士	新世纪人才	纳米电子学	副研	2008 年至今
16	邢英杰	男	45	博士	全国优博	物理电子学	副教授	2008 年至今
17	王晶云	女	44	博士		电子显微学	副教授	2000 年至今
18	申自勇	男	46	博士		扫描探针	副教授	2000 年至今
19	潘华勇	男	47	博士		电子显微学	副研	2004 年至今
20	郭等柱	男	48	博士		物理电子学	副研	2005 年至今



21	叶林晖	男	47	博士		理论计算	副教授	2008 年至今
22	孙文涛	女	39	博士		纳米电子学	副教授	2008 年至今
23	廖建辉	男	39	博士		纳米电子学	副研	2008 年至今
24	戴恩光	男	51	博士		光电子学	副教授	2009 年至今
25	康宁	男	39	博士		纳米电子学	副研	2011 年至今
26	黄少云	男	41	博士		纳电子学与 纳米器件物 理	副教授	2011 年至今
27	黄珏华	男	43	博士		物理电子	副教授	2014 年至今
28	高崧	男	48	博士		扫描探针	讲师	2002 年至今
29	丁力	男	31	博士	全国优博提 名, 北京市 优博	纳米电子学	助研	2015 年至今
30	岳双林	女	39	博士		微纳加工	高工	2006 年至今
31	董立军	男	41	学士		微纳加工	高工	2013 年至今



二、实验室成员在学术机构任职情况

姓名	学术任职
彭练矛	国际物理学杂志“Journal of Applied Physics”的副主编 国际显微学杂志“Ultramicroscopy”编委 国际晶体学会电子衍射专业委员会委员 中国电子显微学会副理事长 中国晶体学会副理事长 中国真空学会副理事长 北京大学学位委员会委员 北京大学研究生奖助工作专家委员会委员 北京大学理工科人才评估专家委员会委员 北京大学信息科学技术学院学位委员会、学术委员会委员 北京大学电子学系主任 北京大学纳米器件物理与化学教育部重点实验室主任 北京大学微纳加工实验室主任 北京大学碳基纳米电子学研究中心主任
张锦	英国皇家化学会会士 Carbon 杂志副主编 Nano Research 杂志编委 化学学报和光散射学报编委 北京市低维碳材料科学与工程研究中心副主任 北京大学化学与分子工程学院副院长 北京大学纳米化学研究中心副主任 北京大学纳米器件物理与化学教育部重点实验室副主任
陈清	金属学报编委 中国真空学会理事 中国材料研究学会纳米材料与器件分会理事 中国仪表功能材料学会 ALD 学会委员 北京大学纳米器件物理与化学教育部重点实验室副主任



李彦	Journal of Materials Chemistry A 杂志副主编 ACS Nano 杂志顾问编委 Nano Research 编委
徐洪起	Frontiers of Physics 杂志副主编 Scientific Reports 杂志编委 欧盟科技专家，担任欧盟第七框架科研项目的结题审议专家 欧盟 Horizon 2020 框架下的 FET OPEN 项目申请的评审专家 国家外专局重点引智项目评审专家 中国物理学会低温物理专业委员会委员
张耿民	中国真空学会副秘书长
叶安培	原子与分子物理学报编委 中国生物物理学会理事
戴恩光	中国宇航学会光电子专业委员会常委
侯士敏	真空科学与技术学报副主编 北京大学信息科学技术学院副院长 北京大学纳米科学与技术中心副主任
王永锋	物理化学学报编委 中国化学快报青年编委
郭等柱	中国真空学会质谱分析与检漏专委会委员



三、2015 年实验室成员承担的主要课题目录

序号	批准号	类别	项目名称	负责人	起止时间	总经费 (万元)
1.	2011CB933002	国家重大科学研究计划“纳米研究”专项项目	碳基无掺杂纳电子器件和集成电路/新型纳米光电子器件	彭练矛 (首席)	2011.1-2015.12	813
2.	2011CB933003	国家重大科学研究计划“纳米研究”专项项目课题	碳纳米结构的可控制备和表征	李彦	2011.1-2015.12	592
3.	2011CB933001	国家重大科学研究计划“纳米研究”专项项目课题	高性能碳基 CMOS 器件和集成电路	张志勇	2011.1-2015.12	676
4.	2011CB932601	国家重大科学研究计划“纳米研究”专项项目课题	碳纳米管的结构调控、生长机制与应用探索	张锦	2011.1-2015.12	297
5.	2012CB932703	国家重大科学研究计划“纳米研究”专项项目	新型高性能半导体纳米线电子器件和量子器件/新型半导体纳米线量子电子器件研究	徐洪起 (首席)	2012.1-2016.8	976
6.	2012CB932702	国家重大科学研究计划“纳米研究”专项项目课题	环栅半导体纳米线超高频器件的基础研究	陈清	2012.1-2016.8	703
7.	2013CB933404	国家重大科学研究计划“纳米研究”专项项目课题	单分子纳米磁体自旋态检测与输运性质调控	王永锋	2013.1-2017.8	561
8.	2013CB933604	国家重大科学研究计划课题	新型场发射纳米材料及物理机制研究	张耿民	2013.1-2017.8	414
9.	2012BAF14B14	国家科技支撑项目	全自动光镊-光刀显微操纵系统	叶安培	2012.7-2016.6	414
10.	2011YQ0301240201	国家重大科学仪器设备开发专项	基于石墨烯壳层的 SHINERS 技术及基底制备	张锦	2011.10-2015.12	250



11.	2011CB921904	973	基于 Dirac 费米子系统的新型器件的物理原理研究与应用探索	梁学磊 参加	2011.1-2015.12	187.5
12.	61321001	国家自然科学基金创新群体项目	纳米尺度的高性能电子与量子器件的理论与方法	彭练矛	2014.1-2016.12	600
13.	21125103	国家自然科学基金杰出青年基金	无机化学	李彦	2012.1-2015.12	200
14.	61322105	国家自然科学基金优秀青年项目	碳基纳米电子学	张志勇	2014.1-2017.12	100
15.	61390504	国家自然科学基金重大项目	高性能石墨烯器件与电路的批量制备与优化	彭练矛	2014.1-2018.12	440
16.	61427901-002	国家自然科学基金重大仪器项目	二维电子材料及纳米量子器件的研究和原位分析仪器	彭练矛 /参加	2015.1-2019.12	800
17.	91221202	自然科学基金委重大研究计划重点项目	纳米线复合量子结构中的电子纠缠及其器件研究	徐洪起	2013.1-2016.12	320
18.	21233001	国家自然科学基金重点项目	平整基底上的拉曼信号增强技术及其应用	张锦	2013.1-2017.12	300
19.	91421303	国家自然科学基金重点项目	复合量子结构中的拓扑量子态和量子纠缠态研究	徐洪起	2015.1-2017-12	500
20.	21433011	国家自然科学基金重点项目	单层二维共价网络结构的构筑策略与性质研究	王栋/ 王永峰	2015.1-2019.12	140
21.	61171023	国家自然科学基金面上项目	金属氧化物有序纳米结构阵列在染料电池中的应用	张耿民	2012.1-2015.12	60
22.	61271051	国家自然科学基金面上项目	基于平行阵列碳纳米管的射频晶体管和电路	彭练矛	2013.1-2016.12	95
23.	51272006	国家自然科学基金面上项目	碳纳米管异质结构的控制制备及其在光电转换器件中的应用	张锦	2013.1-2016.12	80



24.	61271050	国家自然科学基金面上项目	高介电氧化物薄膜局域阻变特性和机理研究	申自勇	2013.1-2016.12	76
25.	61371001	国家自然科学基金面上项目	内电场驱动下石墨烯表面电子发射特性的实验研究	魏贤龙	2014.1-2017.12	83
26.	61376126	国家自然科学基金面上项目	亚 20 纳米碳纳米管 CMOS 器件研究	张志勇	2014.1-2018.12	82
27.	11374016	国家自然科学基金面上项目	软物质波导与神经信号传输物理机制研究	许胜勇	2014.1-2017.12	89
28.	11374022	国家自然科学基金面上项目	应变对单层/少层 MoS ₂ 纳米片及其器件的性能的影响	陈清	2014.1-2017.12	89
29.	11374019	国家自然科学基金面上项目	基于石墨烯三端和多端纳米器件的量子输运研究	康宁	2014.1-2017.12	88
30.	21373020	国家自然科学基金面上项目	自旋交叉配合物自旋双稳态的可逆调控	王永锋	2014.1-2017.12	83
31.	61571016	国家自然科学基金面上项目	高性能碳基瞬态电子器件和集成电路	胡又凡	2016.1-2019.12	76.8
32.	21573014	国家自然科学基金面上项目	单分子自旋电子器件的构建和输运性质测量	廖建辉	2016.1-2019.12	80
33.	61306079	国家自然科学基金青年基金项目	钙钛矿结构有机金属卤化物量子点太阳能电池的研究	孙文涛	2014.1-2016.12	25
34.	11304003	国家自然科学基金青年基金项目	电子显微镜中同一个纳米结构多种物性的综合研究	魏贤龙	2014.1-2016.12	26
35.	7021403008	国家自然科学基金青年基金项目	单分子磁体自旋态的磁交换力显微镜研究	李娜	2015.1-2017.12	25
36.	26161401006	国家自然科学基金青年基金项目	基于碳纳米管的极低开启电压二极管及其射频电路	丁力	2015.1-2017.12	8
37.	21129001	基金委海外及港澳学者合作研究基金	二维氮化硼材料的控制生长及其在拉曼光谱中的应用	张锦	2012.1-2015.12	120



38.	11528407	基金委海外及港澳学者合作研究基金	二维半导体的制备, 优化和光电器件应用	楼峻/ 陈清	2016. 1- 2017. 12	20
39.	D141100000614001	北京市科委重大项目	碳基集成电路用碳纳米管材料规模化制备技术研究	彭练矛	2014. 3- 2015. 12	200
40.	D151100003315004	北京市科委重大项目	有源智能卡碳纳米管芯片模块开发	张志勇	2015. 1- 2016. 12	492
41.	D141100000614001	北京市科委项目	碳基集成电路用碳纳米管材料规模化制备技术研究	张锦	2014. 6- 2015. 12	225
42.	Z141100003814006	北京市科委项目	显示驱动用碳纳米管薄膜晶体管研制	梁学磊	2014. 1- 2015. 12	100
43.	Z15110000331501	北京市科委科技计划	集成电路用碳纳米管工程化制备化学气相沉积设备研制	张志勇	2015. 7- 2017. 12	100
44.	Z151100003315009	北京市科委创新项目	100kHz 碳纳米管CPU 研制	彭练矛	2015. 1- 2016. 12	600
45.	Z15110000311507	北京市科委专项项目	北京碳基集成电路技术与产业发展路径研究	彭练矛	2015. 1- 2015. 6	30
46.	201241	全国优秀博士学位论文作者专项基金	单原子层碳纳米材料表面的电子发射特性和机理研究	魏贤龙	2012. 1- 2016. 12	42
47.	113003A	教育部重点项目	基于碳纳米管材料的高性能电子器件	梁学磊	2013. 8- 2015. 8	50
48.	20120001110093	高等学校博士学科点专项基金	光镊诱导表面增强拉曼光谱技术及其在蛋白结构检测中的应用	叶安培	2014. 1- 2017. 8	12
49.	20130001110030	高等学校博士学科点专项基金	扫描电子显微镜中同一单根纳米结构多种物性的综合研究	魏贤龙	2014. 1- 2016. 12	12
50.	2015T80021	博士后特别资助	基于碳纳米管的能量转换器	丁力	2015. 7- 2016. 3	15
51.		国防预研项目	碱金属微结构原子气室封装技术	郭等柱	2013. 7- 2015. 6	120



52.		总装项目	碱金属微气室封装设备改造与气室性能提高	郭等柱	2014. 4-2016. 4	20
53.		国防预研项目	场发射飞行时间质谱仪研制	郭等柱	2014. 11-2016. 4	95
54.		国防预研项目	几种电子元器件散热和力学仿真与试验	郭等柱	2015. 8-2016. 9	40
55.	HQ-141 2-CTO- TE-026	横向项目	CNT-TFT 显示技术研究	梁学磊	2014. 12-2017. 6	400
56.		横向项目	薄膜摩擦发电显示方案	胡又凡	2014. 9-2015. 7	15



四、2015 年实验室发表的高影响因子论文的刊物分布

刊物	篇数	刊物	篇数
Nat. Mater. (IF36.5)	1	Nano Energy (IF10.3)	5
Chem. Soc. Rev. (IF33.4)	1	NPG Asia Mater. (IF10.1)	1
Nat. Chem. (IF25.3)	1	Small (IF8.4)	4
Acc. Chem. Res. (IF22.3)	1	Chem. Mater. (IF8.3)	1
Adv. Mater. (IF17.5)	2	J. Mater. Chem. A (IF7.4)	2
Nano. Lett. (IF13.6)	5	Nanoscale (IF7.4)	7
ACS Nano (IF12.9)	4	Nano. Res. (IF7.0)	5
J. Am. Chem. Soc. (IF12.1)	5	Chem. Commun. (IF6.8)	1
Adv. Funct. Mater. (IF11.8)	2	ACS Appl. Mater. Inter. (IF6.7)	4
Nat. Commun. (IF11.5)	4	Biosens. Bioelectro. (IF6.4)	1
Angew. Chem. Int. Ed. (IF11.2)	1	Carbon (IF6.2)	2



五、主要研究成果目录

(一) 2015 年 SCI 论文目录

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100. Yanhui Chen, Gengmin Zhang and Ziyong Shen, “Two-step anodization fabrication of ordered ZrO₂ nanotube arrays”, **JOURNAL OF THE**



AUSTRALIAN CERAMIC SOCIETY 51 (2015) 29-35.

101. Guiwei Wang, Yingjie Xing, “Effect of copper phthalocyanine buffer layer on open circuit voltage in organic solar cells”, **JOURNAL OF INFRARED AND MILLIMETER WAVES** 34 (2015) 396-400.
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(二) 邀请报告

1. Lian-Mao Peng, “Graphene based high performance Hall elements”, **The second International Forum on graphene**, Shenzhen, May 21-22, 2015. (Plenary Talk)
2. Lian-Mao Peng, “Graphene based high performance Hall elements and integrated circuits”, **International Symposium on Physics and Device Applications of Two-dimensional Materials**, Nanjing University, China, July12-15, 2015. (Plenary talk)
3. Lian-Mao Peng, “Carbon Nanotube Electronics - Extending Moore’s Law to the End and Beyond the Roadmap”, **The Seventeenth Annual Conference and Sixth International Conference of the Chinese Society of Micro-Nano Technology**, Shanghai, China, October11-14, 2015. (Plenary talk)
4. Lian-Mao Peng, “基于碳纳米管的发光、探测及光互连”，**第二届全国光电材料、器件及发展趋势研讨会**，青海省，2015年8月1-3日，2015. (Plenary Talk)
5. Lian-Mao Peng, “碳基电子、光电子和霍尔传感器件”，**2015 分子磁性前沿研讨会**，天津，2015年8月3-6日，2015. (Plenary Talk)
6. Lian-Mao Peng, “2020 年之后的电子学：碳基电子学的机遇和挑战”，**中国物理学会 2015 年秋季学术会议**，吉林大学，2015年9月11-13日，2015. (Plenary Talk)
7. H. Q. Xu, “国际半导体物理界的发展现状与展望及第 33 届国际半导体物理



- 大会简介”，第二十届全国半导体物理学术会议，山西 临汾，2015 年 7 月 16-19 日，2015. (**Plenary Talk**)
8. Lian-Mao Peng, “Carbon based nanoelectronic devices and sensors”, **U.S.-China Nanomodular Materials and Systems by Design (NMSD) Workshop**, Tsinghua University, March 26, 2015. (invited talk)
 9. Lian-Mao Peng, Zhiyong Zhang, Sheng Wang, and Xuelei Liang, “Carbon nanotube transistors: toward fundamental limits”, **16th International Conference on the Science and Application of Nanotubes (NT15)**, Nagoya, Japan, June 29- July 3, 2015. (invited talk)
 10. Lian-Mao Peng, “Light emission and detection with carbon nanotubes”, **2015 PKU-UTokyo Summer Camp**, Tokyo, Japan, July 20-24, 2015. (invited talk)
 11. Lian-Mao Peng, “Carbon nanotube electronics: merits and fundamental limits”, **The 6th International Conference on Nanoscience and Technology**, Beijing, China, September 3-5, 2015. (invited talk)
 12. Panpan Zhang, Zhiyong Zhang and Lian-Mao Peng, “Carbon nanotube thin film transistor and performance projection”, **The 2nd Multifunctional Nanomaterials Forum Between Sungkyunkwan University and Peking University**, Korea, September 9-11, 2015. (invited talk)
 13. Lian-Mao Peng, “Carbon Nanotube Electronics – More and More than Moore”, “Carbon Nanotubes: Preparation, Characterization and Applications”, **PACIFICHEM 2015 Chemical Congress**, Honolulu, Hawaii, December 15-20, 2015. (invited talk)
 14. Lian-Mao Peng, “Carbon nanotube based field-effect transistors: merits and fundamental limits Frontier and Perspectives in Molecular Spintronics”, **PACIFICHEM 2015 Chemical Congress**, Honolulu, Hawaii, December 15-20, 2015. (invited talk)
 9. Hongqi Xu, “Quantum Devices Made from Semiconductor InSb Nanowires”, **The 6th International Conference on Nanoscience & Technology**, Beijing, China, September 3-5, 2015. (invited talk)



10. Hongqi Xu, “Quantum Devices Made from Semiconductor InSb Nanowires”, **2nd SKKU-PKU Bilateral Forum on Multifunctional Nanomaterials**, Korea, September 9-12, 2015. (invited talk)
11. Jin Zhang, “Growth of High-Density Horizontally Aligned SWNT Arrays using Trojan Catalysts”, **International Symposium on engineering application of carbon nano materials**, Jinan, February 1-2, 2015. (invited talk)
12. Jin Zhang, “Growth of High-Density Horizontally Aligned SWNT Arrays using Trojan Catalysts”, **7th Workshop on Nucleation and Growth of Single Wall Carbon Nanotubes**, Houston, America, April 10-14, 2015. (invited talk)
13. Jin Zhang, “Lighting up the Raman Signal of Molecules in the Vicinity of Graphene Related Materials”, **The Third International Symposium on advanced technology in Raman spectroscopy**, Xiamen, May 6, 2015. (invited talk)
14. Jin Zhang, “Materials, and Energy (iSOME-2015)”, **the International Symposium on Optoelectronics**, Nanjing, June 2, 2015. (invited talk)
15. Jin Zhang, “Growth of High-Density Horizontally Aligned SWNT Arrays using Trojan Catalysts”, **The 16th International Conference on the Science and Application of Nanotubes (NT15)**, Nagoya, Japan, June 27-July 4, 2015. (invited talk)
16. Jin Zhang, “CVD Growth of Single-Walled Carbon Nanotubes with Controlled Structures for Nanodevice Application”, **2nd SKKU-PKU Forum on Multifunctional Nanomaterials**, Korea, September 9-10, 2015. (invited talk)
17. Jin Zhang, “CVD Growth of Single-Walled Carbon Nanotubes with Controlled Structures for Nanodevice Applications”, **2nd Asian-European Symposium on Organic Optoelectronics**, Edinburgh, October 26, 2015. (invited talk)
18. Jin Zhang, “CVD Growth of Single-Walled Carbon Nanotubes with Controlled Structures for Nanodevice Applications”, **The 6th A3 Symposium on Emerging Materials**, Fukuoka, Japan, November 9-10, 2015. (invited talk)
19. Jin Zhang, “CVD Growth of Single-Walled Carbon Nanotubes with Controlled



- Structures for Nanodevice Applications”, **6th International Collaborative and Cooperative Chemistry Symposium**, Seoul, November 16-17, 2015. (invited talk)
20. Yan Li, “What we know about Chirality Controlled Growth of Single-Walled Carbon Nanotubes”, **FNTG 48**, Tokyo, Japan, February 21-23, 2015.(invited talk)
 21. Yan Li, “Chirality-Specific Growth of Single-Walled Carbon Nanotubes Using Intermetallic Compound Catalysts with Well-Defined Structures”, **INF-2015**, Nanjing, April 10-12, 2015. (invited talk)
 22. Yan Li, “Chirality-specified single-walled carbon nanotubes: growth and characterization”, **The 6th Workshop on Nanotube Optics and Nanospectroscopy**, Kloster Banz, Germany, June 1-4, 2015. (invited talk)
 23. Yan Li, “Important factors in chirality-specific growth of single-walled carbon nanotubes”, **The 16th International Conference on the Science and Application of Nanotubes**, Nagoya, Japan, June 29-July 3, 2015.(invited talk)
 24. Yan Li, “Chirality-specific growth of single-walled carbon nanotubes”, **ChinaNANO 2015**, Beijing, September 3-5, 2015. (invited talk)
 25. Yan Li, “Using intermetallic catalysts to grow chirality-specific single-walled carbon nanotubes”, **2nd SKKU-PKU Forum on Multifunctional Nanomaterials**, Korea, September 10-11, 2015. (invited talk)
 26. Qing Chen, “Study on the relationship between property and structure of nanostructures and nanodevices”, **6th Annual Symposium, PKU-UCLA Joint Research Institute in Science and Engineering**, June 26-27, 2015. (invited talk)
 27. Qing Chen, “About the contact and the interface in 2D MoS₂-based transistors”, **International Center for Quantum Materials (ICQM) Summer School 2015**, Beijing, China, July 6-10, 2015. (invited talk)
 28. Qing Chen, “Study on the relationship between property and structure of nanostructures and nanodevices”, **International Symposium on Nanomaterials and Nanotechnology**, University of Science and Technology Beijing, September 1-2, 2015. (invited talk)



29. Qing Chen, “Study on the relationship between property and structure of nanostructures and nanodevices”, **2nd SKKU-PKU Forum on Multifunctional Nanomaterials**, Korea, September 9-12, 2015. (invited talk)
30. Shengyong Xu and Gang Li, “Three Dimensional Micro-Fluid Channels for Lab-on-Chips”, **4th Annual Conference and EXPO of AnalytiX-2015**, in Nanjing, China, April 25-28, 2015. (invited talk)
31. Shengyong Xu, JingJing Xu and Fan Yang, “The roles of membrane in electrical systems of lives”, **4th Annual World Congress of Advanced Materials-2015**, Chongqing, China, May 27-29, 2015. (invited talk)
32. Shengyong Xu, “Light in life: The natural role of electromagnetic wave in electrical communication of a biosystems”, **Fifth International Conference on Optofluidics**, Taipei, Taiwan, July 26-29, 2015. (invited talk)
33. Shengyong Xu, JingJing. Xu, “Electrostatic Micro-Tweezers”, **Chinese micron nanotechnology Institute Seventeenth Annual Academic Conference and the Sixth International Conference**, Shanghai, October 11-14, 2015. (invited talk)
34. Shengyong Xu and JingJing Xu, “A Prototype of Electrostatic Micro-Tweezers in Fluid”, **International Conference on Small Science 2015**, Phuket, Thailand, November 4-7, 2015. (invited talk)
35. Xianlong Wei, “Abnormal Electron Emission from Individual Joule-Heated Carbon Nanotubes”, **The 2nd International Symposium of Advanced Inorganic Materials**, Wuhan, China, January 29, 2015. (invited talk)
36. Xianlong Wei, “Abnormal Electron Emission from Individual Self-Joule-Heated Carbon Nanotubes”, **The 16th IEEE International Vacuum Electronics Conference, (IVEC2015)**, Beijing, China, April 27-29, 2015. (Keynote talk)
37. Yongfeng Wang, “Assembling molecular Sierpiński triangle fractals”, **The second China Japan Symposium on the catalysis of nano energy**, Fuzhou, November, 2015. (invited talk)
38. Yongfeng Wang, “Single magnetic molecules studied by LT-STM”, **Pacific Regional International Conference on Chemistry**, Hawaii America, December



- 15-20, 2015. (invited talk)
39. Shengyong Xu, “Generation of Electromagnetic Solitons by Ion Channels in a Bio-Membrane”, **Advances in Microfluidics and Nanofluidics 2015 Ph. Forum**, Beijing, China, Aug. 19-24, 2015.(Keynote talk)
40. H. Q. Xu, “Signatures of Majorana Fermions in Topological Superconducting Nanowires”, **第一届凝聚态物理会议**, 北京, 2015 年 7 月 15 -17 日, 2015 (invited talk)
41. 张锦, “Growth of High-Density Horizontally Aligned SWNT Arrays using Trojan Catalysts”, **WILEY-ICCAS Symposium**, 北京, 2015 年 3 月 31 日, 2015(invited talk)
42. 张锦, “单壁碳纳米管的结构控制生长方法研究”, **西北五省电镜会**, 兰州, 2015 年 8 月 1-4 日, 2015. (invited talk)
43. 张锦, “单壁碳纳米管的结构控制生长方法研究”, **第十届有机固体会议**, 北京, 2015 年 8 月 7-10 日, 2015. (invited talk)
44. 张锦, “单壁碳纳米管的结构控制生长方法研究”, **第十七届全国晶体生长与材料学术会议(CCCG-17)**, 哈尔滨, 2015 年 8 月 11-15 日, 2015. (invited talk)
45. 张锦, “Surface-enhanced Raman Scattering on 2-Dimensional Layered Materials”, **第十八届全国光散射学术会议**, 成都, 2015 年 10 月 22 日, 2015. (invited talk)
46. 张锦, “特定结构单壁碳纳米管的控制生长”, **温州大学化材学院瓯江高端学术论坛**, 温州, 2015 年 11 月 27-29 日, 2015. (invited talk)
47. Yan Li, “Using Intermetallic Catalysts from Cluster Precursor to Grow Chirality-Specific Single-Walled Carbon Nanotubes”, **第六届全国多酸学术会议**, 大连, 2015 年 9 月 18-20 日, 2015. (invited talk)
48. Qing Chen, “The structure-dependent properties of InAs nanowires and their devices”, **2015 年电子科技大学“基础与前沿科学论坛”**, 成都, 2015 年 12 月 15-17 日, 2015. (invited talk)
49. Qing Chen, “轴向应变对一维纳米材料性能的影响”, **2015 全国电子显微学学术年会**, 成都, 2015 年 10 月 13-18 日, 2015. (invited talk)



50. 魏贤龙, “纳米材料的全程原位电镜研究_从生长到器件性能测量”, **2015 全国电子显微学年会**, 成都, 2015 年 10 月 13-18 日, 2015. (invited talk)
51. 魏贤龙, “InAs 纳米线力、力电、理化特性原位研究”, **2015 全国电子显微学年会**, 成都, 2015 年 10 月 13-18 日, 2015. (invited talk)
52. 魏贤龙, “单根碳纳米管在焦耳加热下的反常电子发射特性”, **新型碳纳米管阴极极高真空测量前沿高端学术会议**, 西安, 2015 年 10 月 23 日, 2015. (invited talk)
53. 王永锋, “Assembling molecular Sierpiński triangle fractals”, **第一届中国化学快报化学化工前沿研讨会**, 天津, 2015 年 6 月, 2015. (invited talk)
54. 王永锋, “Single magnetic molecules studied by LT-STM”, **2015 分子磁体前沿研讨会**, 天津, 2015 年 8 月, 2015. (invited talk)
55. 王永锋, “Single magnetic molecules studied by LT-STM”, **中国物理学会 2015 年秋季学术会议**, 长春, 2015 年 9 月, 2015. (invited talk)
56. 王永锋, “Assembling molecular Sierpiński triangle fractals”, **第二届中国表面物理化学会议**, 大连, 2015 年 9 月, 2015. (invited talk)
57. 王永锋, “Assembling molecular Sierpiński triangle fractals”, **中国电子显微学年会**, 成都, 2015 年 10 月 13-18 日, 2015. (invited talk)
58. 张志勇, “石墨烯霍尔元件和集成电路”, **中国物理年会秋季会议**, 长春, 2015 年 9 月, 2015. (invited talk)
59. 黄少云, 王积银, 潘伟, P. Caroff, 潘东, 赵建华, 徐洪起, “III-V 族半导体纳米线高性能电子和量子器件”, **第二十届全国半导体物理学术会议**, 山西临汾, 2015 年 7 月 16-19 日, 2015. (invited talk)
60. 康宁, “Coherent single charge transport in MBE-grown InSb nanowire”, **第 14 届全国低温物理学大会**, 杭州, 2015 年 4 月 1-4 日, 2015. (invited talk)

(三) 国际会议一般报告和墙报

1. Yao Guo, Qing Chen, “Study on the contact between MoS₂ and metals”, **2015 MRS Spring Meeting & Exhibit**, San Francisco, California, USA, April 6-10, 2015. (oral presentation)
2. Mengqi Fu, Tuanwei Shi, Dong Pan, Jianghua Zhao, Xiaoye Wang, Tao Yang,



- Qing Chen, “Scaling down the field effect transistors based on individual InAs nanowire”, **2015 MRS Spring Meeting & Exhibit**, San Francisco, California, USA, April 6-10, 2015. (oral presentation)
3. Gengmin Zhang, “Behaviors of field emitters under pulsed voltages”, **International Conference on vacuum electronics 2015**, April 27-29, 2015. (oral presentation)
 4. Jingjing Xu, Ludi Jin, Yong Zhang and Anpei Ye, “Single cell identification and dynamic process investigation with Laser Tweezers-Raman Spectroscopy”, **The 3rd International Conference on Advanced Applied Raman Spectroscopy**, Xiamen, May 5-6, 2015. (oral presentation)
 5. Dan Yang, Dengzhu Guo, Gengmin Zhang, “A pulsed field emission electron source used in a time-of-flight mass spectrometer”, **The 28th International Vacuum Nanoelectronics Conference**, Guangzhou, China, July 3-17, 2015. (oral presentation)
 6. Xianlong Wei, “Graphene-Based Electron Emitters and Vacuum Transistors”, **The 28th International Vacuum Nanoelectronics Conference (IVNC2015)**, Guangzhou, China, July 13-17, 2015. (oral presentation)
 7. Ming Li, Jingyun Wang, Kan Li, Yingjie Xing and H. Q. Xu, “Controlled growth of InAs nanowires by chemical vapor deposition”, **The twentieth National Conference on semiconductor physics**, Linfen Shanxi, July 16-19, 2015. (oral presentation)
 8. Jiyin Wang, Shaoyun Huang, Dong Pan, Jianhua Zhao, H. Q. Xu, “Electron spin quantum phase transition in InAs semiconductor nanowire quantum dots”, **The twentieth National Conference on semiconductor physics**, Linfen Shanxi, July 16-19, 2015. (oral presentation)
 9. Wei Pan, Shaoyun Huang, P. Caroff, Kan Li, H. Q. Xu, “InSb nanowire planar ring gate field effect device with high switching ratio and low leakage current”, **The twentieth National Conference on semiconductor physics**, Linfen Shanxi, July 16-19, 2015. (oral presentation)



21. Yumei Jing, Jinxiong Wu, Hailin Peng, Shaoyun Huang, H. Q. Xu, “Micro nano processing of topological insulator Bi₂Te₃ nano sheet and its quantum dot device”, **The twentieth National Conference on semiconductor physics**, Linfen Shanxi, July 16-19, 2015. (oral presentation)
10. Wei Pan, Shaoyun Huang, P. Caroff, Kan Li and H. Q. Xu “Encapsulated gate-all-around InSb nanowire field-effect transistors with a high on/off ratio and a low leakage current at off-state”, **EP2DS/MSS International conference**, Sendai, Japan, July 26-31, 2015. (poster)
11. Ming Li, Jingyun Wang, Kan Li, Yingjie Xing and H. Q. Xu, “Growth of InAs nanowires with controlled morphologies and crystal structure”, **17th International Conference on Modulated Semiconductor Structures**, Sendai, Japan, July 27-31, 2015. (oral presentation)
12. Ming Li, Jingyun Wang, Kan Li, Yingjie Xing and H. Q. Xu, “Epitaxial growth of single crystal and twin superlattice InAs nanowires by chemical vapor deposition,” **17th International Conference on Modulated Semiconductor Structures** , Sendai, Japan, July 27-31, 2015. (oral presentation)
13. Gengmin Zhang, “Solar escape revisited: the appropriate utilization of the reduced mass of the spacecraft-Earth system”, **International Conference on Physics Education (ICPE 2015)**, Beijing, August 9-14, 2015. (oral presentation)
14. Xing Li, Xianlong Wei, Tingting Xu, Dong Pan, Jianhua Zhao, Qing Chen, “Crystal Structure-Dependent Electromechanical Properties of InAs Nanowires”, **The 6th International Conference on Nanoscience and Technology**, Beijing, China, September 3-5, 2015. (poster).
15. Mengqi Fu, Tuanwei Shi, Dong Pan, Jianhua Zhao, Qing Chen, “Electrical characteristics of ultrathin InAs nanowires”, **The 6th International Conference on Nanoscience and Technology**, Beijing, China, September 3-5, 2015. (poster).
16. Ludi Jin , Han Wang, Anpei Ye , Shu Zhang, “In-situ Detection of Single Cell under the Microgravity Environment Simulated by Raman Tweezers”, **6th China-Germany Workshop on Microgravity and Space Life Sciences** ,



- Hangzhou, September 8-10, 2015. (oral presentation)
17. Jiyin Wang, Shaoyun Huang, Dong Pan, Jianhua Zhao and H. Q. Xu, “Highly Tunable Multiple Quantum Dots Made in InAs Nanowires by Local Finger Gates”, **SSDM2015 International conference**, Sapporo, Japan, September 19-21, 2015. (oral presentation)
18. Le Huang, Zhiyong Zhang, Bingyan Chen, and Lianmao Peng , “Flexible Graphene Hall Sensors with High Sensitivity”, **2015 IEEE International Electron Devices Meeting**, Washington Hilton Washington, December 7-9, 2015. (oral presentation)
19. Jin Zhang, “Growth of High-Density Horizontally Aligned SWNT Arrays using Trojan Catalysts”, **Pacificchem2015-Carbon Nanotubes**, Hawaii America, December 15-20, 2015. (oral presentation)
20. Jin Zhang, “Lighting up the Raman Signal of Molecules in the Vicinity of Graphene Related Materials”, **Pacificchem2015-SERS**, Hawaii America, December 15-20, 2015. (oral presentation)

(四) 专利

2015 年度授权专利

2015 年授权专利			
专利号	专利名称	发明人	授权日期
ZL20131050865 5.5	一种基于纳米线的立式环栅晶体管及其制备方法	史团伟、陈清、许胜勇、徐洪起	2015 年 12 月 04 日
ZL20111010336 34	一种二氧化钛光电极及其制备方法	孙文涛、彭练矛、艾果	2015 年 07 月 22 日
ZL20131016916 0.4	多组分超分子水凝胶在作为响应材料 and 自愈材料中的应用	张锦、杜然	2015 年 03 月 04 日
ZL20121044389 1.9	半导体性单壁碳纳米管的制备方法	李彦、彭飞、秦校军、杨娟	2015 年 06 月 17 日
ZL20121024164 0.2	用于制备手性选择性和导电性选择性单壁碳纳米管的催化剂及其制备方法和应用	李彦、杨烽、彭飞、杨娟	2015 年 12 月 16 日



2015 年度申请专利

申请号	专利名称	申请人
2015102505626	一种电子发射体功函数可调的阴极及其阵列	魏贤龙
2015102600917	导电沟道全包裹纳米线平面环栅场效应器件及其制备方法	李强、潘伟、黄少云、徐洪起
2015100791854	有机无机钙钛矿型锂离子电池电极材料	孙文涛
2015100786926	一种水热制备有机无机钙钛矿材料的方法	孙文涛
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PCT/CN2013/000830	用于制备手性选择性和导电性选择性单壁碳纳米管的催化剂及其制备方法和应用	李彦、杨烽、彭飞、杨娟



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