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### 个人资料

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### 教育经历

2002—2007年, 南开大学, 凝聚态物理专业, 理学博士;

1998—2002年, 南开大学, 应用光学和经济学专业, 理学和经济学学士;

### 工作经历

2017-今, 南开大学物理科学学院, 副院长;

2015-今, 南开大学泰达应用物理研究院, 教授;

2013-2014年, 美国圣路易斯华盛顿大学, 访问学者;

2009-2015年, 南开大学泰达应用物理学院, 副教授;

2007-2009年, 南开大学泰达应用物理学院, 讲师。





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### 个人简介

薄方, 南开大学, 教授, 物理科学学院副院长。2002年, 南开大学, 理学和经济学学士; 2007年, 南开大学, 理学博士。2013年至2014年, 美国圣路易斯华盛顿大学, 访问学者。

近期主要从事铌酸锂微纳光子学研究, 在片上光源, 耦合、传输控制、非线性光学器件研究方面取得系列成果。实现了高品质因子二氧化硅-铌酸锂复合微腔, 单晶、多晶、周期极化、稀土离子掺杂铌酸锂微腔的批量制备。对铌酸锂微腔共振波长的主动调控, 热光效应, 倍频、和频等非线性光学效应开展了系统研究。实现片上微盘、微环腔激光器。

迄今为止, 在Phys. Rev. Lett.、Adv. Mater.等杂志上发表论文60余篇, SCI引用1100余次, h-index: 21。与他人合著英文专著章节一章。主持重大项目课题2项, 国家自然科学基金项目4项, 其他项目5项; 参与国家重大科学研究计划、国家自然科学基金重点项目等十余项科研项目。

每年招收博士研究生2名、硕士研究生2-3名。欢迎对集成(微纳)光电子学器件及其应用感兴趣, 拟从事微纳光学、非线性光学、激光物理、量子光学等方面研究的同学联系报考!





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### 研究方向

近期主要从事铌酸锂微纳光子学相关的研究。每年招收博士研究生2名、硕士研究生2-3名。欢迎对集成（微纳）光电子学器件设计、加工、测试和应用相关工作感兴趣，拟从事微纳光学、非线性光学、激光物理、量子光学等方面研究的同学联系报考！

### 科研项目：

- [7] 92050111, 掺铌LNOI微环腔光频率梳研究, 国家自然科学基金重大研究计划项目培育项目, 2021.01-2023.12, 主持
- [6] 2019YFA0705003, 铌酸锂薄膜光子结构中的非线性效应与频率梳应用, 国家重点研发计划项目课题, 2019.12-2024.11, 主持
- [5] 11734009, 铌酸锂晶体微腔中的非线性过程与调控研究, 国家自然科学基金重点项目, 2018.01-2022.12, 参与 (南开部分负责人)
- [4] 11674181, 基于铌酸锂微盘腔的窄带宽可调谐宣布式单光子源, 国家自然科学基金面上项目, 2017.01-2020.12, 主持
- [3] 11374165, 微米尺寸铌酸锂晶体回音壁模式微腔的制备和光学非线性增强研究, 国家自然科学基金面上项目, 2014.01-2017.12, 主持
- [2] 10904077, 利用法珀腔共振效应提高有机材料中慢光的相对延迟, 国家自然科学基金青年项目, 2010.01-2012.12, 主持
- [1] 200800551034, 动态和静态光栅中光脉冲形变的抑制, 教育部新教师基金项目, 2009.01-2011.12, 主持

### 代表性工作：

[5] 与孔勇发老师课题组合作, 从晶体生长开始, 制备铟离子掺杂LNOI微纳光学器件。基于铟离子掺杂LNOI平台实现了微盘腔激光器 (*Sci. China-Phys. Mech. & Astron.*, 64(3), 234263 (2021))、微环腔激光器 (*Opt. Lett.*, 46(13), 3275 (2021))、光波导放大器 (*Chin. Opt. Lett.*, 19(6), 60008 (2021)) 和基于耦合微腔光学分子的单模激光器 (*Sci. China-Phys. Mech. & Astron.*, 64(9), 294216 (2021))。

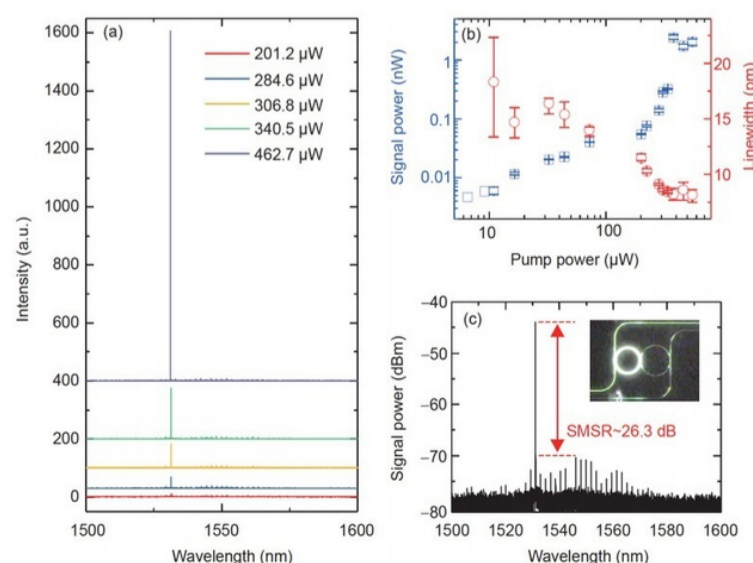


图5 LNOI单模激光器性能测试结果。

[4] 利用粒子群优化算法，设计高效率（89%/coupler）铌酸锂薄膜光栅耦合器。并利用电子束光刻是反应离子束刻蚀实现制备，TE（TM）模式耦合效率达到72%/coupler和62%/coupler，上述指标均为铌酸锂薄膜光栅耦合器效率最高值（*Opt. Lett.*, 45, 6651 (2020)）。

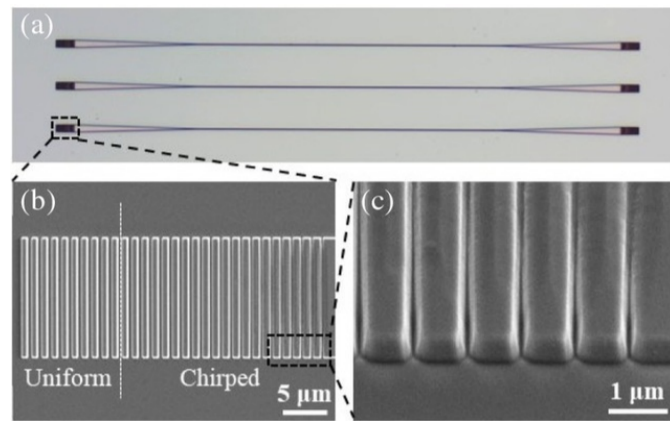


图4. LNOI光栅耦合显微图片。

[3] 利用光刻、刻蚀、化学机械抛光和基于原子力显微镜的畴极化技术，我们成功实现了品质因子 $1e5$ 量级，单周期、双周期等周期极化铌酸锂微盘腔的制备(*Photon. Res.*, 8, 311 (2020))，在其中实现铌酸锂最大二阶非线性系数 $d_{33}$ 的使用和倍频、三倍频、四倍频等非线性过程。

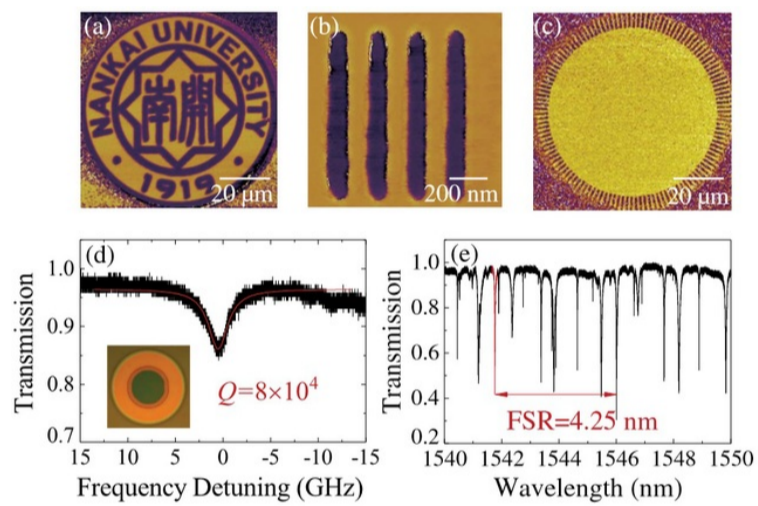


图3. 周期极化铌酸锂微腔的 (a-c) 显微镜图像和 (d, e) 透射谱。

[2] 利用激光脉冲沉积技术在二氧化硅盘形微腔上镀铌酸锂薄膜的办法，我们在无需后处理的情况下成功实现了 $1e5$ 品质因子铌酸锂/二氧化硅复合微盘腔的制备(*Adv. Mater.* 27, 8075 (2015))，该工作提出了一种全新的从下到上的铌酸锂微腔制备方案。

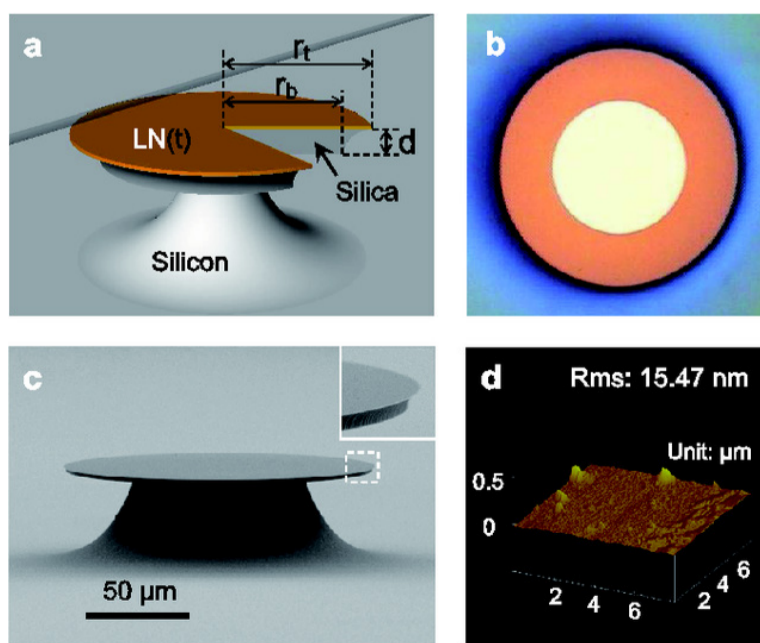


图3. 铌酸锂二氧化硅复合腔的 (a) 结构示意图、(b) 光学显微镜图像、(c) 扫描电子显微镜图像和 (d) 原子力显微镜图片。

[1] 在国际上首次实现了 $1e6$ 以上品质因子的位于晶片上的铌酸锂微盘腔的批量制备，利用电光效应实现了微腔共振波长的主动调控(*Opt. Express* 23, 23072 (2015)); 系统研究了单晶铌酸锂微盘腔内的热光效应，观察并解释了强光泵浦情况下，微腔透射谱的振荡效应(*Opt. Express*, 24, 21869 (2016))。

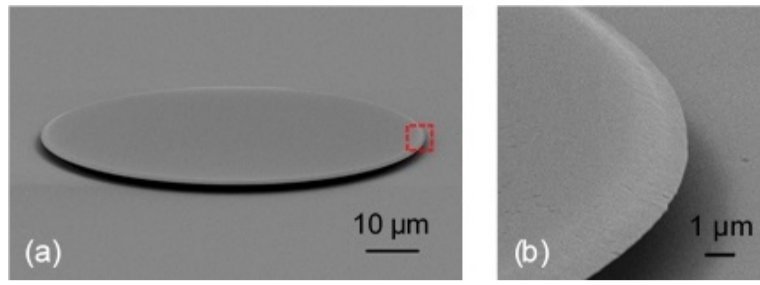


图1. 单晶铌酸锂微盘腔的 (a) 扫描电子显微镜图像与 (b) 其边缘的放大图像。



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### 研究成果

#### 2022年

- [64] X. Wu, L. Zhang, Z. Hao, R. Zhang, R. Ma, F. Bo\*, G. Zhang\*, and J. Xu\*, Broadband second-harmonic generation in step-chirped periodically poled lithium niobate waveguides, *Opt. Lett.* 47, 1574-1577 (2022).
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- [62] Q. Luo, C. Yang, Z. Hao, R. Zhang, R. Ma, D. Zheng, H. Liu, X. Yu, F. Gao, F. Bo\*, Y. Kong\*, G. Zhang\*, J. Xu\*, On-chip ytterbium-doped lithium niobate microdisk lasers with high conversion efficiency, *Opt. Lett.*, 47, 854-857 (2022).
- [61] A. Gao#, C. Yang#, L. Chen#, R. Zhang, Q. Luo, W. Wang, Q. Cao, Z. Hao, F. Bo\*, G. Zhang\*, J. Xu\*, Directional emission in X-cut lithium niobate microresonators without chaos dynamics, *Photon. Res.*, 10(2), 401 (2022).

#### 2021年

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- [59] R. Zhang, C. Yang, Z. Hao, D. Jia, Q. Luo, D. Zheng, H. Liu, X. Yu, F. Gao, F. Bo\*, Y. Kong\*, G. Zhang\*, and J. Xu\*, Integrated lithium niobate single-mode lasers by the Vernier effect. *Sci. China-Phys. Mech. & Astron.*, 64(9), 294216 (2021).
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- [56] Q. Luo, Z. Hao, C. Yang, R. Zhang, D. Zheng, S. Liu, H. Liu, F. Bo\*, Y. Kong\*, G. Zhang\*, J. Xu\*, Microdisk lasers on an erbium-doped lithium-niobate chip, *Sci. China-Phys. Mech. & Astron.*, 64(3), 234263 (2021). (Editors' Focus)

#### 2020年

- [55] S. Kang#, R. Zhang#, Z. Hao, D. Jia, F. Gao, F. Bo\*, G. Zhang\*, J. Xu\*, High-efficiency chirped grating couplers on lithium niobate on insulator, *Opt. Lett.*, 45(24), 6651-6654 (2020). (Editors' Pick)
- [54] J. Lin, F. Bo\*, Y. Cheng\*, J. Xu\*, Advances in on-chip photonic devices based on lithium niobate on insulator, *Photon. Res.*, 8(12) 1910-1936 (2020).
- [53] X. Gao, L. Yang, H. Lin, L. Zhang, J. Li, F. Bo, Z. Wang, L. Lu\*, Dirac-vortex topological cavities, *Nat. Nanotechnol.*, 15, 1012-1018 (2020).
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#### 2019年

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#### 2018年

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#### 2017年

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#### 2016年

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#### 2013年以前

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