宁波市技术发明奖公示信息表

**成果名称：**近室温热电制冷材料与器件及产业化关键技术

**提名等级：**一等奖或二等奖

**代表性论文专著目录：**

1. Qiang Zhang,\* Kaikai Pang, Yue Wu, Xuan Li, Dongxiang Lv,\* Liya Miao, Xiaojian Tan,\* Haoyang Hu, Jiehua Wu, Li Kong, Xufeng Hou, Baoguo Ren, Guo-Qiang Liu, and Jun Jiang\*, Robust Bi2(Te,Se)3 thermoelectrics from large shrinkage ratio extrusion drives advanced peltier microcooler and power generator. *Adv. Funct. Mater.* **2025**, *35*, 2500731.
2. Qiang Zhang, Minhui Yuan, Kaikai Pang, Yuyou Zhang, Ruoyu Wang, Xiaojian Tan,\* Gang Wu, Haoyang Hu, Jiehua Wu, Peng Sun, Guo-Qiang Liu, and Jun Jiang\*, High-performance industrial-grade p-type (Bi,Sb)2Te3 thermoelectric enabled by a stepwise optimization strategy. *Adv. Mater.* **2023**, *35*, 2300338.
3. Min Wang, Qiang Zhang,\* Kaikai Pang, Minhui Yuan, Qiaoyan Pan, Ruyuan Li, Liya Miao, Xiaojian Tan,\* Haoyang Hu, Jiehua Wu, Peng Sun, Guo-Qiang Liu, and Jun Jiang\*, Robust Homogeneous Segmented Power Generator Driven by Sb2Te3-Based Thermoelectrics, *Adv. Mater.* **2025**, *37*, 2503128.
4. Liya Miao, Qiang Zhang,\* Minhui Yuan, Ruyuan Li, Min Wang, Xiaojian Tan,\* Jiehua Wu, Guo-Qiang Liu, and Jun Jiang\*, Thermo-Electric-Mechanical Coupling Selects Barrier Layer for Advanced Bismuth Telluride Thermoelectric Generator, *Adv. Mater.* **2025**, *37*, 2503580.
5. Gang Wu,† Qiang Zhang,† Xiaojian Tan,\* Yuntian Fu, Zhe Guo, Zongwei Zhang, Qianqian Sun, Yan Liu, Huilie Shi, Jingsong Li, Jacques. G. Noudem, Jiehua Wu, Guo-Qiang Liu, Peng Sun, Haoyang Hu, and Jun Jiang\*, Bi2Te3-Based Thermoelectric Modules for Efficient and Reliable Low-Grade Heat Recovery, *Adv. Mater.* **2024**, *36*, 2400285.
6. Ruyuan Li, Gang Wu, Qiang Zhang,\* Qiaoyan Pan, Min Wang, Kaikai Pang, Liya Miao, Xiaojian Tan, Peng Sun, Haoyang Hu, Jiehua Wu,\* Guo-Qiang Liu, and Jun Jiang\*, Robust (Bi,Sb)2Te3 Thermoelectrics Due to Engineered Ion Confinement and Microstructure for Advancing Thermoelectric Power Generators, *Adv. Funct. Mater.* **2025**, 2502535.
7. Qiang Zhang,†\* Qiaoyan Pan,† Min Wang, Kaikai Pang, Ruyuan Li, Liya Miao, Xiaojian Tan,\* Haoyang Hu, Jiehua Wu, Peng Sun, Guo-Qiang Liu, Jun Jiang,\* Commercially scalable (Bi,Sb)2Te3 thermoelectrics via interfacial defects evolution for advanced power generators, *Acta Mater.* **2025**, *292*, 121064.
8. Liya Miao, Xiang Lu, Qiang Zhang,\* Xiaojian Tan,\* Lidong Chen, Kaikai Pang, Ruyuan Li, Qianqian Sun, Min Wang, Peng Sun, Jiehua Wu, Guoqiang Liu, Zhenlun Song, Jun Jiang,\* Innovative rotary swaging method drives high performance of n-type Bi2(Te, Se)3 thermoelectrics, *J. Mater. Sci. Technol.* **2025**, *223*, 114–122.
9. Kaikai Pang, Liya Miao, Qiang Zhang,\* Qiaoyan Pan, Yan Liu, Huilie Shi, Jingsong Li, Wenjie Zhou, Zongwei Zhang, Yuyou Zhang, Gang Wu, Xiaojian Tan,\* Jacques G. Noudem, Jiehua Wu, Peng Sun, Haoyang Hu, Guo-Qiang Liu, and Jun Jiang\*, Gradient nanotwins and enhanced weighted mobility synergistically upgrade Bi0.5Sb1.5Te3 thermoelectric and mechanical performance. *Adv. Funct. Mater.* **2024**, *34*, 2315591.
10. Gang Wu,† Qiang Zhang,† Yuntian Fu, Xiaojian Tan,\* Jacques G. Noudem, Zongwei Zhang, Chen Cui, Peng Sun, Haoyang Hu, Jiehua Wu, Guo-Qiang Liu, Jun Jiang,\* High-Efficiency Thermoelectric Module Based on High-Performance Bi0.42Sb1.58Te3 Materials, *Adv. Funct. Mater.* **2023**, *33*, 2305686.

**主要知识产权：**

1. 一种高电压密集型温差电致冷器及其制备方法，发明人：马洪奎；安晓雨；丁汀；粱亮；连洪奎；杨文昭，专利号：ZL201410799672.3，2020年09月15日授权
2. 一种半导体致冷器下脱模装置，发明人：马洪奎；粱亮，专利号：ZL201711201349.1，2021年04月13日授权
3. 一种适用于脆性碲化铋材料的连续热挤压设备，发明人：吴跃；孔繁宇；齐雅青；任保国，专利号：ZL202111582357.1，2024年08月13日授权
4. 一种提高热挤压N型碲化铋性能均匀性的方法，发明人：吴跃；郑斌；韩子川；于淇；粱亮；齐雅青；刘晓伟；吕东翔，专利号：ZL202210938871.2，2024年02月13日授权
5. 一种碲化铋基热电材料及其制备方法，发明人：张强; 蒋俊；谈小建；郭哲；吴港；王泓翔；付亚杰；胡皓阳，专利号：ZL202110274171.3，2023年04月18日授权
6. 一种择优取向的n型碲化铋烧结材料及其制备方法与应用，发明人：熊成龙；石樊帆；王泓翔；谈小建；胡皓阳；刘国强；蒋俊，专利号：ZL202110138674.8，2024年02月23日授权
7. 一种锗铋碲基热电材料及其制备方法，发明人：满娜；熊成龙；刘国强；谈小建；蒋俊，专利号：ZL202110274145.0，2024年02月06日授权
8. 一种碲化铋基热电材料及其制备方法，发明人：端思晨；徐静涛；杨昕昕；蒋俊，专利号：ZL201910067590.2，2022年09月16日授权
9. 一种热电材料及其制备方法，发明人：蒋俊；肖昱琨；吴萌蕾；杨胜辉；徐静涛；李志祥；许高杰，专利号：ZL201310393941.1，2016年01月20日授权
10. 一种碲化铋基块体热电材料的制备方法，发明人：蒋俊；肖昱琨；杨胜辉；许高杰；李志祥；张婷；翟永彪，专利号：ZL201210097407.1，2014年05月07日授权

**主要完成人：**蒋俊、吕冬翔、谈小建、吴跃、张强、俞波

**主要完成单位：**中国科学院宁波材料技术与工程研究所、中国电子科技集团公司第十八研究所、浙江万谷半导体有限公司

**提名者：**中国科学院宁波材料技术与工程研究所