

# Special Session IV

## Special Session Basic Information:

### 专栏题目 Session Title

中文：“多维材料创新与协同能源管理：面向智能物联的低碳技术革命”  
——聚焦热电转换、储能热控与智能软材料的交叉融合  
英文："Multidimensional Material Innovation and Collaborative Energy Management: Low-Carbon Technology Revolution for Intelligent Internet of Things (IoT)"  
— Focusing on the Cross-Integration of Thermoelectric Conversion, Thermal Energy Storage and Control, and Intelligent Soft Materials

### 专栏介绍和征稿主题 Introduction and topics

中文：  
在全球能源结构转型与碳中和目标驱动的背景下，能源技术的革新亟需突破单一材料或系统的局限，实现“材料—器件—网络”的多维协同创新。为此，以“多维材料创新与协同能源管理”为核心主题，聚焦热电转换技术、储能热管理技术与智能软材料的前沿交叉，探索其在智能物联（IoT）赋能下的低碳化、智能化应用场景，旨在为全球学术界与工业界搭建跨学科对话平台，推动能源技术从微观材料设计到宏观系统集成的全链条突破。

感兴趣的话题包括但不限于：

- 高性能热电材料设计与热—电耦合机制优化
- 热电-储能联合系统的能效提升与动态管理策略
- 低碳城市能源规划中的热电技术应用场景
- 高安全性相变储能材料与复合结构设计
- 动力电池热失控预警及多尺度散热技术（液冷/热管/相变材料）
- 可再生能源储热系统与热—电协同管理策略
- 极端环境下储能装置的热力学行为与寿命预测
- 磁控微纳机器人在能源传输与界面调控中的应用
- 智能软材料在柔性热电装置与储能器件中的功能化设计
- 仿生材料驱动的微型能量收集与转换技术
- 基于 IoT 的能源系统数字孪生与动态优化
- 多材料协同的“热—电—储”一体化智慧能源网络
- 微纳机器人集群在能源设备监测与修复中的应用

英文：  
Against the backdrop of global energy structure transformation and carbon neutrality targets, breakthroughs in energy technology are urgently needed to break through the limitations of single materials or systems, achieving multidimensional synergistic innovation of a "material-device-network". To this end, with "Multidimensional Material Innovation and Collaborative Energy Management" as the core theme, focusing on the cutting-edge intersection of thermoelectric conversion technology, thermal energy storage, and control technology, and intelligent soft materials, exploring their low-carbon and intelligent application scenarios empowered by IoT, aimed to build an interdisciplinary dialogue platform for the global academic and industrial communities, promoting a full-chain breakthrough of energy technology from microscopic material design to macro system integration.

Topic of interest include but are not limited to:

- High-performance thermoelectric material design and optimization of thermoelectric coupling mechanisms.
- Enhancement of energy efficiency and dynamic management strategies in thermoelectric-thermal energy integrated systems.

- 3) Application scenarios of thermoelectric technology in low-carbon urban energy planning.
- 4) High safety phase change thermal energy storage materials and composite structure design.
- 5) Thermal runaway warning of power batteries and multi-scale heat dissipation technologies (liquid cooling/heat pipes/phase change materials).
- 6) Strategies for renewable energy thermal storage systems and thermo-electric collaborative management.
- 7) Thermal-mechanical behavior and life prediction of energy storage devices in extreme environments.
- 8) Application of magnetically controlled micro-nano robots in micro-energy transfer and interface regulation.
- 9) Functional design of intelligent soft materials in flexible thermoelectric devices and thermal energy storage devices.
- 10) Biomimetic material-driven micro energy harvesting and conversion technology.
- 11) Digital twinning and dynamic optimization of energy systems based on AIoT.
- 12) Multi-material collaborative "thermal-electric-thermal storage" integrated intelligent energy networks.
- 13) Application of micro-nano robot swarms in energy equipment monitoring and repair.

Special Session Chair(s):



姓名 Name	Tao Lin (林涛)
称谓 Prefix	A/Prof. (教授)
部门 Department	
单位 Organization	Guangzhou City University of Technology (广州城市理工学院)
城市/地区 City/Region	Guangzhou, Guangdong (广东, 广州)

Organizer's Brief Biography

中文：  
林涛 工学博士、广州城市理工学院 教授。致力于热电转换技术与能源高效利用技术的研究，出版编著 2 部，发表 SCI/EI 论文 20 余篇。担任 ICNEPE 2024 Organizing Committee Members，ICPET2022，ICPET2023 技术委员。

英文：  
Dr. Tao Lin, a Professor at Guangzhou City University of Technology. Dr. Lin is dedicated to research in thermoelectric conversion technology and energy-efficient utilization technology. He has authored and edited two publications and has published more than 30 SCI/EI papers. Dr. Lin Tao also holds the role of ICNEPE 2024 Organizing Committee Member, and Technical Committee member for the ICPET2022 and ICPET2023 conferences.



姓名 Name	Jun Li (刘琳)
称谓 Prefix	Lec. (讲师)
部门 Department	School of Chemistry and Chemical Engineering (化学化工学院)
单位 Organization	Kunming University (昆明大学)
城市/地区 City/Region	Kunming, Yunnan (云南, 昆明)

Organizer's Brief Biography

中文：

李俊博士，昆明学院化学化工学院讲师。研究方向包括储能材料、电池热管理技术、气凝胶复合材料。主持省部级项目三项，发表 SCI 论文 30 余篇。申请专利十余项。

英文：

Dr. Jun Li. Holds the position of lecturer at the School of Chemistry and Chemical Engineering, Kunming University. Dr. Li's research focuses on energy storage materials, battery thermal management technology, and the thermal utilization of renewable energy. He has published over 30 SCI papers and applied for more than ten patents.



姓名 Name	Mingfeng Chen (陈明风)
称谓 Prefix	Associate Professor (副教授)
部门 Department	
单位 Organization	Zhejiang University (浙江大学)
城市/地区 City/Region	Hangzhou, Zhejiang (浙江，杭州)

Organizer's Brief Biography

中文：

陈明风博士，浙江大学特聘副教授。主要研究兴趣为智能软材料，包括二维材料的自组装及外场控制，构建基于磷酸锆、氧化石墨烯和钡铁氧体等二维材料的功能材料；磁控微纳米机器人的制备和应用。发表 SCI 论文 20 余篇。曾先后获得钟化（Kaneka）美洲控股公司奖学金、研究生国家奖学金、留学基金委资助及入选拔尖创新人才计划等。

英文：

Dr. Mingfeng Chen, Ph.D. Holds the position of Associate Professor at Zhejiang University. His primary research interests lie in smart soft materials, including the self-assembly and external field control of two-dimensional materials, as well as the construction of functional materials based on two-dimensional materials such as zirconium phosphate, graphene oxide, and barium ferrite. Additionally, he is involved in the preparation and application of magnetically controlled micro-nanorobots. Dr. Chen has published over 20 SCI papers. He has been honored with the Kaneka Americas Holding, Inc. Scholarship, the National Scholarship for Graduate Students, financial support from the China Scholarship Council, and has been selected for the Talents Program for Innovation and Entrepreneurship.