Development of Organic Thermoelectric Materials and Device

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Organic thermoelectric materials can directly transform the waste heat into electrical power without causing any pollution, but their development is limited due to poor performance, especially low conductivity. In my talk, we outline the design strategies which aim to develop high-performing organic semiconductors and their materials in organic thermoelectrics. A series of solution-processed organic semiconducting molecules are reported. These results indicate that these materials can be modulated through successive changes in conjugation length/side chain substituent length and molecular interaction based on a combination of molecular design and solution-processing techniques. Doping organic semiconductors, conjugated polymer composites, and gels with ionic salt or redox couples are used to achieve enhanced thermoelectric performance. Flexible/wearable thermoelectric generator based on these materials will be demonstrated.

Biography

Prof. Cheng-Liang Liu is a Professor of Materials Science and Engineering at National Taiwan University. He received the B.S. and Ph.D. degrees in Chemical Engineering from National Taiwan University in 2002 and 2007, respectively. He then worked as visiting scientist at the University of Washington (USA) from 2005 to 2006, postdoctoral fellow at National Taiwan University from 2008 to 2010, Assistant Professor at Yamagata University (Japan) from 2010 to 2012, Assistant and Associate Professor at National Central University (Taiwan) from 2012 to 2020, before joining National Taiwan University in 2020. His group focuses on exploring organic polymers and hybrid materials, targeting electronic and energy applications, including transistors, memory devices, solar cells, and thermoelectrics.