



## **Department of Materials Science and Engineering Seminar Series 2023**

# **Rational Design of Ionic Thermoelectric Based Energy Convertors and High-performance Ionic Thermoelectric Materials**

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### **Abstract**

Recently, ionic thermoelectric (TE) materials emerge as promising candidates for harvesting low-grade waste heat due to their much higher ionic Seebeck coefficient compared to that of electronic TE materials. However, the further development and potential application of ionic TE materials are still greatly restricted by some shortcomings, including the intermittent work mode of conventional ionic thermoelectric capacitor (ITEC), zero energy output at stable temperature gradient condition as well as the lack of high-performance n-type TE material. In the first work, continuous ionic thermoelectric capacitor (c-ITEC) that can continuously supply power was fabricated. Furthermore, the influencing factors of its TE performance parameters can be well-understood in terms of the proposed equivalent circuit and derived equations. In the second work, combinatorial ionic/electronic thermoelectric converters (CTEC) was prepared by combining both electronic and ionic thermoelectric (TE) components, achieving the non-zero output voltage of ionic TE device at stable temperature gradient. In the third work, the turn over from p- to n-type and great improvement in the n-type ionic Seebeck coefficient of ionogels through synergistic dopings of cations and anions was developed. The n-type figure of merit  $ZT_i$  can be improved to 1.7 at the relative humidity of 91 %.

### **Biography**

Le Qiujuan obtained his bachelor and master's degree majoring in Materials Science and Engineering from Chongqing University in 2016 and 2019. He is currently a Ph.D. candidate

under the supervision of Assoc. Prof. Jianyong Ouyang. His research focuses on the development of high-performance ionic thermoelectric materials and novel ionic thermoelectric devices.

**Please join us!**

HOST: Prof. Ouyang