

Thermoelectric Cooling and Power Generation

Zhifeng Ren

Department of Physics and Texas Center for Superconductivity (TcSUH)
University of Houston
Houston, TX 77204
USA

Abstract

It has been 200 years since Seebeck discovered the phenomenon on voltage generation by a temperature gradient. After such a long time, the only materials for large scale applications in mainly cooling applications are Bi₂Te₃-based p-type Bi_{0.5}Sb_{1.5}Te₃ and n-type Bi₂Te_{2.7}Se₃ even though many materials have been demonstrated to have thermoelectric figure-of-merit (ZT) above 1.0 at different temperatures in recent years. The progress since 2008 is especially significant due to the nanostructure approach, particularly at high temperatures. However, the applications for power generation are still in their infant stage. In this talk, I will present the reasons why power generation applications are so rare, also challenges and opportunities for cooling and power generation in the future.

Biography

Zhifeng Ren is an M. D. Anderson Chair Professor of Physics and the Director of the Texas Center for Superconductivity at the University of Houston (TcSUH). He received his BS in 1984 from Xihua University, MS in 1987 from Huazhong University of Science and Technology, and PhD in 1990 from the Institute of Physics, Chinese Academy of Sciences. His research has been on thermoelectrics, BAs single crystals for high thermal conductivity and carrier mobility, nano materials for enhanced oil recovery, catalysts for water splitting for H₂ generation, heated filters for catching and killing SARS-CoV-2 causing COVID-19 pandemic, carbon nanotubes, solar absorbers, flexible transparent conductors, superconductors, *etc.*

