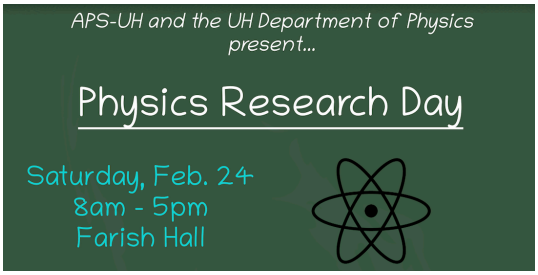

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Study of the Thermoelectric properties of n-type Mg3Sb2 via doping Zr and incorporating MXene

Saturday 24 February 2024 14:00 (12 minutes)

In recent times, there has been a growing interest in thermoelectric Zintl compounds due to their excellent thermoelectric performance across various families. Among these, Mg3Sb2-based Zintl compounds have garnered attention as potential thermoelectric materials. However, their effectiveness is hindered by weak electrical transport properties stemming from their p-type nature. The poor electrical transport characteristics of p-type Mg3Sb2 can be attributed to its high thermal conductivity, low hole concentration, and relatively large band gap of 1.23 eV, primarily resulting from the presence of Mg vacancies. Nevertheless, an excess of Mg can reduce these vacancies, transforming the material into an n-type compound with superior electrical transport properties, thereby making it a more promising candidate for thermoelectric applications. Consequently, n-type Mg3Sb2-based materials have emerged as viable options for temperatures ranging from 300 K to 773 K, owing to their high band degeneracy, low lattice thermal conductivity, low toxicity, and abundance. Among these materials, Te-doped Mg3+xSb1.5Bi0.5 stands out as particularly promising, as the excess Mg combined with moderate Te doping enables the regulation of carrier type and concentration. Notably, Tamaki et al. demonstrated that a sample with a composition of Mg3.2Sb1.5Bi0.49Te0.01 achieved a remarkable figure of merit of zT 1.5 at 716 K. Our objective here is to further enhance the thermoelectric properties of n-type Mg3.2Sb1.5Bi0.49Te0.01 through doping and forming a composite.

Academic year

3rd year

Research Advisor

Dr. Zhifeng Ren

Author: PRADHAN, Suraj

Co-authors: Dr WANG, Dezhi; Dr SHU, Rui; Dr SONG, Shaowei; Dr LIANG, Zhongxin

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