TECHNISCHE UNIVERSITÄT WIEN

INSTITUT FÜR FESTKÖRPERPHYSIK
Institute of Solid State Physics

Wiedner Hauptstr. 8-10/138, 1040 Wien
www.ifp.tuwien.ac.at

EINLADUNG zum IFP-SEMINAR

GeSbTe Thin Film for Ultra High Thermoelectric Performance

Kuei-Hsien Cheng

Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan
and Center for Condensed Matter Sciences, National Taiwan University, Taipei, Taiwan

Host: Ernst Bauer

Termin: **Donnerstag, 06. September 2018, 11:00 Uhr**

Ort: Institut für Festkörperphysik, TU Wien
Wiedner Hauptstraße 8-10, 1040 Wien
Seminarraum DC rot 07 (roter Bereich, 7. OG)

Abstract:

Germanium antimony telluride (GeSbTe) alloy is a popular material in optical and non-volatile memory devices. In the recent years, it has attracted renewed attention due to its potential for thermoelectric applications. In this work, we controlled the phase and vacancy in the alloy to achieve high thermoelectric performance. In order to enhance the thermoelectric property of GeSbTe we attempted both bulk and thin film growth of this alloy. For the bulk samples, the compound was prepared by solid state reaction utilizing high-purity Ge, Sb, and Te to be melted under vacuum at 950 °C, then slowly cooled to 500 °C, followed by a rapid quenching in water or in the air. The sample is pulverized to powder, and followed by single crystal growth in a vertical Bridgman furnace. By careful control of the growth condition such as Ge content and rapid quenching condition we can turn the vacancies and defects in the crystal. For the thin film samples, we use magnetron sputtering to deposit GeSbTe on a Si substrate. Due to the interface effect between the GeSbTe film and Si substrate, we can sustain the high temperature cubic phase down to room temperature and study their thermoelectric properties. A ZT above 2.5 has been demonstrated at relative low temperature of 400 °C. Detailed characterization to elucidate the properties will be presented.

[1] R. Sankar, D. P. Wong, C.S. Chi, W.L. Chien, J.S. Hwang, F.C. Chou, L.C. Chen and K.H. Chen, CrystEngComm, 17, 3440, (2015).
[2] I.N. Chen, C.W. Chong, L.M. Lyu, D.P. Wong, W.L. Chien, A. Anbu, Y.F. Chen, L.C. Chen, and K.H. Chen, Physica Status Solidi A 213, 3122-3129 (2016).
[3] D.P. Wong, W.L. Chien, C.Y. Huang, C.E. Chang, A. Ganguly, L.M. Lyu, J.S. Hwang, L.C. Chen, and K.H. Chen, RSC Advances 6, 98952 (2016).