

LNQE-Kolloquium 14.01.2015

Mittwoch, den 14.01.2015 um 17:30 Uhr + anschließendes Get-Together
im Seminarraum + Foyer des LNQE-Forschungsbaus (Gebäude 3430),
Schneiderberg 39, 30167 Hannover, Deutschland

„Chalcogenide-type nanostructures: Topological insulator nature versus thermoelectric performance“

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In this presentation we challenge the interconnection between thermoelectric performance and topological insulator nature of chalcogenide-type materials. While topological surface states seem to play minor role in the thermoelectric transport in bulk materials [1], it will be shown that they severely contribute to the transport in nanostructures due to their high surface-to-volume ratio [2-4]. Specifically, thermoelectric and magnetotransport experiments on ALD-grown Sb_2Te_3 thin films as well as on VLS-grown Sb_2Te_3 and Bi_2Te_3 nanowires are presented and the results of which are interpreted using thermoelectric transport calculations [5]. In all systems investigated, the maximum TE performance converges towards the maximum TE performance of the surface states with decreasing system size into the nanometer-range, limiting their application in efficient thermoelectric devices.

References:

- [1] Kornelius Nielsch, Julien Bachmann, Johannes Kimling, and Harald Böttner, "Thermoelectric Nanostructures: From Physical Model Systems towards Nanograined Composites", *Adv. Eng. Mater.* **1**, 713-731 (2011).
- [2] Bacer Hamdou, Johannes Gooth, August Dorn, Eckhard Pippel, and Kornelius Nielsch, "Aharonov-Bohm oscillations and weak antilocalization in topological insulator Sb_2Te_3 nanowires", *Appl. Phys. Lett.* **102**, 22110 (2013).
- [3] Bacer Hamdou, Johannes Gooth, August Dorn, Eckhard Pippel, and Kornelius Nielsch, "Surface state dominated transport in topological insulator Bi_2Te_3 nanowires", *Appl. Phys. Lett.* **103**, 193107 (2013).
- [4] Johannes Gooth, Bacer Hamdou, August Dorn, Robert Zierold, and Kornelius Nielsch, "Resolving the Dirac cone on the surface of Bi_2Te_3 topological insulator nanowires by field-effect measurements" *Appl. Phys. Lett.* **104**, 243115 (2014).
- [5] Johannes Gooth, Jan Goeran Gluschke, Robert Zierold, Martin Leijnse, Heiner Linke, Kornelius Nielsch, "Thermoelectric performance of classical topological insulator nanowires", *arXiv:1405.1592* (2014).

