Synthesis and characterisation of topological insulator nanoribbons

G. Kunakova[1], S. Charpentier[2], J. Andzane[1], L. Galletti[2], T. Bauch[2], D. Erts[1], F. Lombardi[2]

[1]Institute of Chemical Physics, University of Latvia, Latvia

[2] Quantum Devices Physics Laboratory, Department of Microtechnology and Nanoscience,

Chalmers University of Technology, Sweden

e-mail: gunta.kunakova@lu.lv

Topological insulators (TI) form a new class of materials with attracting electronic properties as the linear dispersion of the surface states. These states are protected from the nonmagnetic impurity scattering due to the time reversal symmetry [1]. Detecting the topological surface states, one has to consider the interfering bulk transport. Application of the TI nanoribbons possessing large surface to volume ratio will enhance the surface contribution, therefore TI nanoribbons are excellent tool for study of the topological surface states [2].

Here we focus on synthesis of the large aspect ratio Bi_2Se_3 nanoribbons and their transport properties.

To fabricate the high quality Bi_2Se_3 nanoribbons, catalystfree growth method has been developed. Structural characterisations reveal high crystallinity within stoichiometric composition of the nanoribbons. Magnetotransport measurements of the individual nanoribbons at the temperature of 2K have been performed. Angular dependence measurements confirm that observed Shubnikov de Haas (SdH) oscillations originates from the 2D surface states. From the SdH oscillations physical parameters as 2D electron density, surface electron mobility and cyclotron mass are determined.

The support from ERAF Nr.015/0008/2DP/2.1.1.2./14/APIA/VIAA/004 project is gratefully acknowledged.

References

1. H. Zhang, C.X. Liu, X.L. Qi, X. Dai, Z. Fang, S.-C. Zhang, Nat. Phys., **5**, 438, (2009).
2. F. Xiu, L. He, Y. Wang, L. Cheng, L.-T. Chang, M. Lang, G. Huang, X. Kou, Y. Zhou, X. Jiang, Z. Chen, J. Zou, A. Shailos, K. L. Wang, Nat. Nanotechnol., 6,. 216 (2011).