TOPOLOGICAL INSULATORS BASED ON SEMI-METALLIC HgCdTe

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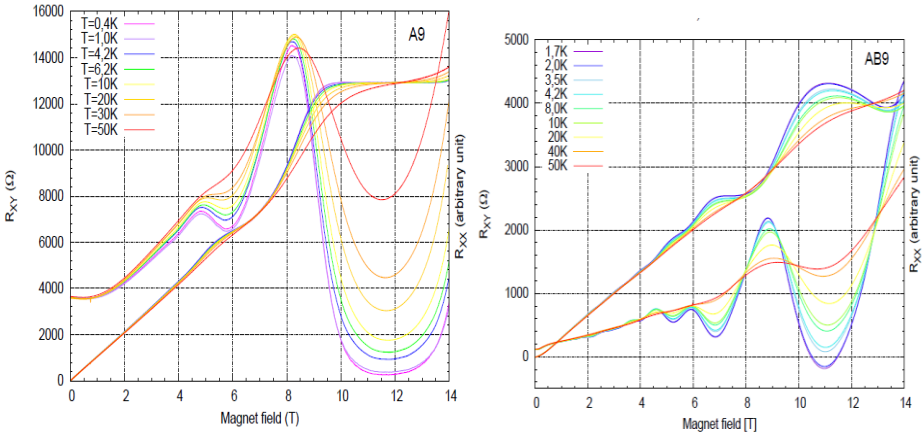
Experimental results of the magneto-transport measurements are presented over a wide interval of temperatures for several samples of MCT (x ≈ 0.13 - 0.15) grown by MBE: A series – thin layers (thickness about 100 nm) strained, AB series– not strained thin layers and B series – thick ones with thickness about 1 μm [1]. The results obtained for sample A9 – strained thin layer on the GaAs/CdTe substrate – are presented in Fig. 1a. The $R_{xx}(B)$ and $R_{xy}(B)$ curves are shown for different temperatures over wide range from 0.4 K to 50 K. The well-defined quantized plateaus in R_{xy} with values $h/(2e^2)$ = 12.9 kΩ, accompanied by vanishing R_{xx} is observed at 0.4 K what explicitly indicate on the Integer Quantum Hall Effect (IQHE) and Shubnikov-de Haas (SdH) oscillations characteristic for 2D electron gas. The quantization in integer multiples of $\sigma_o = e^2/h$ is evident with the Landau filling factor ν equals to 2, 4 and 6. The $R_{xx}(B)$ and $R_{xy}(B)$ curves are reproducible up to 20 K and above this temperature the Integer Quantum Hall Conductivity (IQHC) is observed up to 50 K. That can be explained by conductivity on topologically protected surface states (TPSS) [2]. An amazing temperature stability of the SdH-oscillation period and amplitude is observed in the entire temperature interval of measurements up to 50 K for samples of series AB (Fig.1b) and B also. Moreover, the IQHE behavior of the Hall resistance is registered in the same temperature interval. In the case of not strained layers (series AB and B) it is assumed that the QHC on the TPSS (or on the Resonant Surface States) contributes also to the conductance of the bulk samples.



a) b)

Figure 1: Magneto-resistances, R_{xx} and R_{xy} vs magnetic field at the temperatures of 0.4 - 50 K for a) sample of series A; b) sample of series AB.

[1] G. Tomaka et al., *Phys. Rev. B* **93**, 205419 (2016).

[2] C. Brüne et al., *Phys. Rev. Lett.* **106**, 126803 (2011))

We acknowledge support from the grant - contract WND-PPK.01.03.00-18-053/12.