Topological insulators based on the semi-metallic HgCdTe alloys

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Experimental results of the magneto-transport measurements over a wide interval of temperatures for nineteen layers of MCT (x ≈ 0.13 - 0.15) grown by MBE are presented in this report. The results obtained for sample A9 – strained thin layer on the GaAs/CdTe substrate – are presented. The Rxx(B) and Rxy(B) curves are shown for different temperatures over wide range from 0.4K to 50K. The well-defined quantized plateaus in Rxy with values h/(2e2) = 12.9 kΩ, accompanied by vanishing Rxx is observed at 0.4K what explicitly indicate on the Integer Quantum Hall Effect (IQHE) and Shubnikov-de Haas (SdH) oscillations characteristic for 2D electron gas. The Rxx(B) and Rxy(B) curves are reproducible up to 20K and above this temperature the Integer Quantum Hall Conductivity (IQHC) is observed up to 50K. That can be explained by conductivity on topologically protected surface states (TPSS). An amazing temperature stability of the SdH-oscillation period and amplitude is observed in the entire temperature interval of measurements up to 50K. Moreover, the IQHE behavior of the Hall resistance is registered in the same temperature interval. In the case of not strained layers it is assumed that the QHC on the TPSS contributes also to the conductance of the bulk samples. As Topological Insulator (IT) HgCdTe have important advantages: high value of the Fermi velocity – approximately the same as for graphene, what leads to an increase in the attractiveness of this TI for future applications: as Weyl phase. In comparison with pure HgTe: the energy dispersion in semimetal HgCdTe is closer to linearity in the wider range of the momentum what lead to an increase in the attractiveness of the TI based on semimetal HgCdTe alloy for future applications: as massless Weyl fermions for example with addition of non-compensated spins of Mn.

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