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Magnetic field sensors based on 2D materials as graphene and Bi2Se3

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Ultra-thin layered materials as graphene (Gr) and, belonging to the topological insulators, Bi2Se3 represent unique physical and chemical properties due to the reduced dimensionality (2D materials). The both materials: Gr [1] and Bi2Se3 [2] exhibit specific properties as regards surface conductivity what makes them interesting for construction of the highly sensitive magneto-resistive sensors. Elaboration of the preparation procedure of the magnetic field sensors based on the ultra-thin active layers and optimization of their surface structure, and architecture were the main aims of this work.
During this talk, we shall present developed by us manufacturing procedure of such flat electronic devices as magnetic field sensors with the active part based on layered materials with thickness in the sub-nm scale [3]. Manufacturing procedure uses: maskless photolithography for Gr (a process replacing the Ar+ ions etching process), transfer of the macroscopic (but ultra-thin due to exfoliation processing) flakes of Bi2Se3 and deposition of metals (as electrodes) using the magnetron (DC) sputtering. In our approach the sensor active layer have been shaped by the ion sputtering (Ar+) as opposed to the previously used techniques of digestive reactive etching [4]. The proposed solution prevents oxidation of the surface in the case of semiconductor substrates functionalization, and therefore it is more compatible with CMOS technology. We shall also present our original sensor architecture developed to enhance the sensor sensitivity and signal to noise ratio [5].
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