Topological insulator eutectic heterostructures

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The main interest in topological insulators is due to their topologically protected gapless surface states, which have potential use in dissipationless topological electronics, quantum computation, photonics, and spintronics[1,2]. However they exhibit some disadvantages, which limit their use. This includes surface degradation when exposed to the air atmosphere, low surface-to-volume ratio, and the need for various materials junctions for applications in devices[3]. Here we propose utilizing eutectic composites as topological isolator heterostructures. Eutectics has gained recently attention as materials for energy[4], metamaterials[5], plasmonics[6] and other applications[7].

While combining the benefits of eutectic composites and topological insulators we aim at overcoming their main disadvantages. We will demonstrate the growth of the topological insulator eutectic heterostructures and their microstructures, as well as preliminary properties. In our heterostructures, at least one phase is based on the topological insulator A^{V}-B^{VI} system (A^{V}= Sb, Bi; B^{VI}= Se, Te) and the other phase gives additional properties likeferromagnetism, anti-ferromagnetism, Rashba effect, and the photovoltaic effects.

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