Topological Material in the III–V Family: Heteroepitaxial InBi on InAs

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Abstract, InBi(001) is formed epitaxially on InAs(111)-A by depositing Bi onto an In-rich surface [1]. Angle-resolved photoemission measurements reveal topological electronic surface states, close to the M high symmetry point. This demonstrates a heteroepitaxial system entirely in the III–V family with topological electronic properties. InBi shows coexistence of Bi and In surface terminations, in contradiction with other III–V materials. For the Bi termination, the study gives a consistent physical picture of the topological surface electronic structure of InBi(001) terminated by a Bi bilayer rather than a surface formed by splitting to a Bi monolayer termination. Theoretical calculations based on relativistic density functional theory and the one-step model of photoemission clarify the relationship between the InBi(001) surface termination and the topological surface states, supporting a predominant role of the Bi bilayer termination. Furthermore, a tight-binding model based on this Bi bilayer termination with only Bi–Bi hopping terms, and no Bi–In interaction, gives a deeper insight into the spin texture.

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