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Asymmetric topological interfaces and charge transfer in epitaxial Bi2Se3/II-VI superlattices ZHIYI CHEN, The Graduate Center - CUNY, The City College of New York - CUNY, LUKASF ZHAO, INNA KORZHOVSKA, THOR GARCIA, MARIA TAMARGO, LIA KRUSIN-ELBAUM, The City College of New York - CUNY, KYUNGWHA PARK, Virginia Tech. — Access to charge transport through Dirac surface states in topological insulators (TIs) can be challenging due to their intermixing with the bulk or with non-topological subsurface two-dimensional electron gas (2DEG) quantum well states. Formed by bending of bulk electronic bands near the surface, 2DEG states arise via charge transfer to the topological surfaces, so the choice of layers abutting these surfaces is critical. Here we report molecular beam epitaxial growth of $Bi_2Se_3/Zn_xCd_{1-x}Se$ superlattices that support only one topological surface channel per TI layer. The topological nature of conducting channels is evidenced by π-Berry phase and by the two-dimensional weak antilocalization. Both density functional theory calculations and transport measurements suggest that a single topological Dirac cone per TI layer arises from the asymmetry between the Se-terminated and Zn-terminated interfaces of $Zn_xCd_{1-x}Se$ with Bi_2Se_3. Our findings suggest that topological transport could be controlled by adjusting charge transfer from non-topological spacers in hybrid structures.
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Zhiyi Chen
The Graduate Center - CUNY, The City College of New York - CUNY

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