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Discovery of spin-textured single-Dirac-cone pi-Berry's phase Topological Insulator states in Bi2Se3, Bi2Te3 and Sb2Te3 and related new materials¹ M. ZAHID HASAN, Princeton University, DAVID HSIEH, YUQI XIA, L. ANDREW WRAY, DONG QIAN, J. HUGO DIL, FABIAN MEIER, LUC PATTHEY, JURG OSTERWALDER, ALEXEI FEDOROV, HSIN LIN, ARUN BANSIL, DAVID GRAUER, YEWSAN HOR, ROBERT CAVA — The topological insulator is a fundamentally new state of quantum matter that exhibits exotic quantum-Hall-like behavior even in the absence of an applied magnetic field. In this talk, I will present new results on the topological insulator in Bi1-xSbx beyond Ref.[1,2], and then report our discovery and findings of a new generation of topological insulators with a single spin-helical surface Dirac cone that can be gated by chemical tuning of the surface [3,4,5]. A method would be discussed how superconducting and magnetic interactions [6] can be realized within the topological matrix. [1] "A topological Dirac insulator in a quantum spin Hall phase", D. Hsieh et al., Nature 452, 970 (2008). [2] "Observation of unconventional quantum spin textures in topological insulators", D. Hsieh et al., Science 323, 919 (2009). [3] "Observation of a large-gap topologicalinsulator class with a single Dirac cone on the surface", Y. Xia et al., Nature Phys. 5, 398 (2009). [4] D. Hsieh et al., Phys. Rev. Lett., 103, 146401 (2009). [5] "A tunable topological insulator in the spin helical Dirac transport regime", D. Hsieh et al., Nature 460, 1101 (2009). [6] Preprint (2009).

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