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Rashba Spin-Splitting Control at the Surface of the Topological Insulator Bi_2Se_3 ZHIHUAI ZHU, G. LEVY, B. LUDBROOK, C.N. VEENSTRA, J.A. ROSEN, R. COMIN, D. WONG, P. DOSANJH, Department of Physics and Astronomy, University of British Columbia, Vancouver, BC V6T 1Z1, Canada, A. UBALDINI, Department of Physics, University of Geneva, Switzerland, P. SYERS, N.P. BUTCH, J. PAGLIONE, CNAM, Department of Physics, University of Maryland, College Park, Maryland 20742, USA, I.S. ELFIMOV, A. DAMASCELLI, Department of Physics and Astronomy, Quantum Matter Institute, University of British Columbia, Vancouver, BC V6T 1Z1, Canada — The electronic structure of Bi_2Se_3 is studied by angle-resolved photoemission and density functional theory. We show that the instability of the surface electronic properties, observed even in ultra-high-vacuum conditions, can be overcome via *in situ* potassium deposition. In addition to accurately setting the carrier concentration, new Rashba-like spin-polarized states are induced, with a tunable, reversible, and highly stable spin splitting. *Ab initio* slab calculations reveal that these Rashba states are derived from the 5-quintuple-layer quantum-well states. While the K-induced potential gradient enhances the spin splitting, this may be present on pristine surfaces due to the symmetry breaking of the vacuum-solid interface. Phys.Rev.Lett. 107 186405 (2011)

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