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Giant Rashba spin splitting with unconventional spin texture in a quantum spin Hall insulator[1] CARLOS MERA ACOSTA, OSCAR BABILONIA, University of Sao Paulo, CP 66318, 05315-970, Sao Paulo, SP, Brazil, LEONARDO ABDALLA, University of Colorado, Boulder, Colorado 80309, USA, ADALBERTO FAZZIO, University of Sao Paulo, CP 66318, 05315-970, Sao Paulo, SP, Brazil — We propose a non-centrosymmetric honeycomb-lattice quantum spin Hall effect family formed by atoms of the groups IV, V and VII of the periodic table. We make a structural analysis, a Z_2 characterization. According to our ab-initio phonon calculations, the system formed by Bi, Pb and I atoms is only mechanically stable system. This material presents a Rashba-type spin-splitting and a hexagonal warping effect, which lead to an unusual spin texture. Due to this spin texture, the backscattering is forbidden for both edge conductivity channels and bulk conductivity channels. This suggests that, contrary to what happens in most systems with nontrivial topological phases, the bulk states would not pose a problem for spintronic devices. The value of the spin-splitting due to the Rashba effect is about 60 meV, which is huge compared with the values found in 2D systems and surprisingly is on the order of the highest found in 3D systems.

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