Spin texture of bismuth bilayers: an *ab initio* calculation

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Bismuth is a very heavy element whose electronic structure is very influenced by the spin-orbit coupling (SOC). Nowadays, surface states with strong SOC induce spin splitting, [1] that is promising for applications in spintronics. *Ab initio* calculations have been shown that Bi bilayers (BLs) present large Rashba splitting due to the significant SOC. Furthermore, it was predicted that Bi BLs can present spin quantum Hall (QSH) states. Few layers of Bi stacking along the (111) direction is predicted to be a topological insulator [2]. In this work, using first principles calculations we investigate the band structure and spin texture of Bi BLs stacking along the (111) direction. Our results show that for a certain number of BLs, Bi(111) present two surface states with opposite spin texture, forming a topological Dirac insulator. By increasing the number of BLs a transition to a metal occurs, suppressing the Dirac cone, but keeping a spin texture on the surface states.

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