Numerical study of surface states of 3D-TI materials

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Objective

- Determine optimal conditions for existence of surface states (SS) on a 3D-TI
- Control the spin polarization of SS by placing two 3D-Tis together

Method

- 4-band k.p Hamiltonian for Bi_2Se_3 and Bi_2Te_3
- Bias added to Hamiltonian to mimic asymmetric surface terminations
- Spin-polarizer device parameters analyzed using 2D-Dirac equation

Results

- Physical and chemical attributes of TI thin-film impact the SS dispersion
- Low film thickness and asymmetric growth conditions form displaced Dirac-hyperbolas
- Spin-polarized components have unequal strength in asymmetric film