Anisotropic spin-singlet pairings in Cu$_x$Bi$_2$Se$_3$ and Bi$_2$Te$_3$ WEI-FENG TSAI, National Sun Yat-sen University, Kaohsiung, Taiwan, LEI HAO, GUI-LING WANG, Southeast University, Nanjing, China, TING-KUO LEE, Institute of Physics, Academia Sinica, Taipei, Taiwan, JUN WANG, YONG-HONG YANG, Southeast University, Nanjing, China — We report possible anisotropic spin-singlet pairings in Bi$_2$X$_3$ (X is Se or Te). Among six pairings compatible with the crystal symmetry, two novel pairings show nontrivial surface Andreev bound states, which form flat bands and could produce zero-bias conductance peak in measurements such as point-contact spectroscopy. By considering purely repulsive short-range Coulomb interaction as the pairing mechanism, the dominant super-exchange terms are all antiferromagnetic, which would usually favor spin-singlet pairing in Bi$_2$X$_3$. Mean-field analyses show that the inter-orbital pairing interaction favors a mixed spatial-parity anisotropic pairing state, and one pairing channel with zero-energy surface states has a sizable component. The results provide important information for future experiments.

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