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Dirac Cone Protected by Non-Symmorphic Symmetry and highly dispersive 3D Dirac crossings in ZrSiS LESLIE SCHOOP, Max Planck Institue for Solid State Research, MAZHAR ALI, IBM-Almaden Research Center, CAROLA STRASSER, VIOLA DUPPEL, Max Planck Institue for Solid State Research, STUART PARKIN, IBM-Almaden Research Center, BETTINA LOTSCH, CHRISTIAN AST, Max Planck Institue for Solid State Research — Materials harboring exotic quasiparticles, such as Dirac and Weyl fermions have garnered much attention from the physics and material science communities. Here, we show with angle resolved photoemission studies supported by ab initio calculations that the highly stable, non-toxic and earth-abundant material, ZrSiS, has an electronic band structure that hosts several Dirac cones which form a Fermi surface with a diamond-shaped line of Dirac nodes. We also experimentally show, for the first time, that the square Si lattice in ZrSiS is an excellent template for realizing the new types of 2D Dirac cones protected by non-symmophic symmetry and image an unforseen surface state that arises close to the 2D Dirac cone. Finally, we find that the energy range of the linearly dispersed bands is as high as 2 eV above and below the Fermi level; much larger than of any known Dirac material so far. We will discuss why these characteristics make ZrSiS very promising for future applications.

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