Poster

Topological crystalline insulator candidate ErAsS with hourglass fermion and magnetic-tuned topological phase transition

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Topological crystalline insulators (TCIs) with hourglass fermion surface states enable exploration of remarkable topological phases and are further enriched by crystalline symmetries and magnetic order. However, hourglass fermion surface states are hard to verify for the drawbacks including the air sensitivity, miscellaneous band dispersions crossing Fermi level, and challenging of cleavage in the TCI candidates. We have successfully grown single crystals of a newly layered air-stable compound ErAsS. Its crystal structure is determined to be orthorhombic *Pnma* (No. 62) by using single crystal X-ray diffraction and high-angle angular-dark-field imaging using scanning transmission electron microscopy. The distorted As-atom layer and magnetic order of Er are determined by the single crystal neutron diffraction and first principles calculations. For the paramagnetic phase, ErAsS is expected to be a TCI with hourglass fermion surface state protected by the nonsymmorphic symmetry. Dirac-cone-like bands and nearly linear dispersions in large energy range are experimentally observed, consistent well with first principles calculations. Below $T_N \approx 3.27$ K, ErAsS enters a collinear antiferromagnetic state, which is a trivial insulator with breaking time-reversal symmetry. An intermediate incommensurate magnetic state appears in a narrow temperature range (3.27 K - 3.65 K), exhibiting an abrupt change in magnetic coupling. The results reveal that ErAsS is an experimentally available TCI candidate and provides a unique platform to understand the formation of hourglass fermion surface state and explore magnetic-tuned topological phase transitions.