Hidden Multipolar Orders of Dipole-Octupole Doublets on a Triangular Lattice XIAOQUN WANG, Shanghai Jiao-Tong University, YAODONG LI, GANG CHEN, Fudan University — Motivated by the recent development in strong spin-orbit-coupled materials, we consider the dipole-octupole doublets on the triangular lattice. We propose the most general interaction between these unusual local moments. Due to the spin-orbit entanglement and the special form of its wavefunction, the dipole-octupole doublet has a rather peculiar property under the lattice symmetry operation. As a result, the interaction is highly anisotropic in the pseudospin space, but remarkably, is uniform spatially. We analyze the ground state properties of this generic model and emphasize the hidden multipolar orders that emerge from the dipolar and octupolar interactions. We clarify the quantum mutual modulations between the dipolar and octupolar orders. We predict the experimental consequences of the multipolar orders and propose the rare-earth triangular materials as candidate systems for these unusual properties.

Yaodong Li
Fudan University