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Tunneling frustration induced peculiar supersolid phases in the extended Bose-Hubbard model LIXIN HE, SHAO-JUN DONG, WENYUAN LIU, XIANG-FA ZHOU, GUANG-CAN GUO, ZHENG-WEI ZHOU, YONG-JIAN HAN, University of Science and Technology of China — By using a state of art tensor network state method, we study the ground-state phase diagram of an extended Bose-Hubbard model on square lattice with frustrated next-nearest neighboring tunneling. In the hardcore limit, tunneling frustration stabilizes a peculiar half supersolid (HSS) phase with a SS sublattice and an empty-occupied sublattice away from half filling. A new phase separation regime composes of the HSS and superfluid phases is also identified. In the softcore case, the model show very rich phase diagrams above half filling, including three different types of supersolid phases depending on the interaction parameters. The considered model provides a promising route to realize the stable SS state especially in below half filling region, which can be implemented experimentally with dipolar atoms or molecules.

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