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Supersolidity of Cold Atomic Bose-Fermi mixtures in optical lattices PETER P. ORTH, DORON L. BERGMAN, KARYN LE HUR, Yale University — An important possible mechanism for boson supersolidity in a Bose-Fermi mixture is the existence of a nested Fermi surface. Fermions then tend to exhibit a density wave at the nesting wavevector and imprint this order via boson-fermion interactions onto the bosons, which already support superfluidity. This coexistence of bosonic superfluidity and density wave order is a signature of the supersolid phase. We present new results concerning a cold mixture confined to a triangular optical lattice. For a fermionic density of $n_f = 3/4$ per lattice site, the Fermi surface exhibits both a van-Hove singularity and nesting. With a Landau-Ginzburg and a microscopic mean-field analysis, we predict the supersolid parameter regime in current experimental realizations of Bose-Fermi mixtures, and make comparisons with the square lattice geometry. We also discuss competing low-temperature phases such as a phase separated and a Mott insulating regime. Finally, we consider the case of spatially anisotropic hopping, which allows us to explore a quasi 1d regime of supersolidity.

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