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Fermionic superfluidity with repulsive alkaline-earth atoms in optical superlattices[1] LEONID ISAEV, ANA MARIA REY, JILA, NIST and Department of Physics, University of Colorado, Boulder — We propose a novel route to superfluidity in fermionic alkaline-earth atoms with repulsive interactions, that uses local kinetic-energy fluctuations as a "pairing glue" between the fermions. We exploit different polarizabilities of electronic $^1S_0$ (g) and $^3P_0$ (e) states of the atoms to confine the e- and g- species in different optical superlattices. For example, in a one-dimensional case the e-lattice can be implemented as an array of weakly-coupled double-wells (DWs) with large intra-DW tunneling, and contain one localized e-atom in each DW to avoid losses due to e-e collisions. On the contrary, the shallow g-lattice has a large bandwidth and an arbitrary filling. We consider a nuclear-spin polarized system and demonstrate how kinetic-energy fluctuations of the localized e-atoms mediate an attractive interaction between the g-fermions, thus leading to a p-wave superfluid. We derive a low-energy model and determine the stability of this state against charge-density wave formation and phase separation. Our results can be tested with Yb or Sr fermionic atoms and have a direct relevance for the physics of high-temperature superconductor materials.

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