Many-body phases in optical-lattice systems with alkaline-earth-like atoms. Dynamical Mean Field approach.

E. Bilokon,[1,2] V. Bilokon,[1,2] A. Cichy,[1,3] and A. Sotnikov[2,4]

[1] *Institute of Spintronics and Quantum Information, Faculty of Physics, Adam Mickiewicz University in Poznań, Uniwersytetu Poznańskiego 2, 61-614 Poznań, Poland*

[2] *Karazin Kharkiv National University, Svobody Sq. 4, 61022 Kharkiv, Ukraine*

[3] *Institut für Physik, Johannes Gutenberg-Universität Mainz, Staudingerweg 9, 55099 Mainz, Germany*

[4] *Akhiezer Institute for Theoretical Physics, NSC KIPT, Akademichna 1, 61108 Kharkiv, Ukraine*

We study finite-temperature properties of ultracold mixtures of alkaline-earth-like atoms in state-dependent quasi-two-dimensional optical lattices that can be effectively described by the two-band Hubbard model. We use the Dynamical Mean Field approach (DMFT) with Local Density Approximation (LDA) to include the effects of a (harmonic) trap, which is inevitably present in all experiments with ultracold gases on the lattices, and to obtain the real-space distributions of the density of particles, local order parameters and other local physical observables relevant for the experiments. In certain ranges of densities, we investigate the stability of different possible strongly correlated phases of the atomic system. We estimate the critical temperature below which these phases occur. In order to account for the proximity effects that are usually present at the boundaries between phases in strongly-correlated systems, we extend our analysis using the real-space generalization of DMFT.

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