Low-temperature phases of SU(4)-symmetric fermionic mixtures in optical lattices

A. Sotnikov[1,2] and V. Unukovych[2]

[1] *NSC Kharkiv Institute of Physics and Technology, 1 Akademichna Str., Kharkiv 61108, Ukraine*

[2] *Karazin Kharkiv National University, 4 Svobody Square, Kharkiv 61000, Ukraine*

The quantum gases of alkaline-earth-like atoms are playing a significant role in understanding of physically rich phenomena of multiflavored fermionic mixtures, due to their properties at low temperatures. Since experimentally accessible values for the entropy per particle are currently too high for direct exploration of magnetic phases in the ultracold fermionic gases, the theoretical studies allow to handle such case [1,2]. We apply dynamical mean-field approach to the Hubbard model for the case of four-component SU(4)-symmetric fermionic gas to study both paramagnetic hysteresis between metallic and Mott-insulating phases, as well as transitions between the paramagnetic metal/insulator and antiferromagnetic (AFM) insulator phases. In contrast to previous studies of the half-filled SU(4)-symmetric Hubbard model [3], at quarter filling (one particle per site) we identify both the two-sublattice AFM and plaquette-ordered/four-sublattice AFM phases with the corresponding entropy-driven hierarchy for critical temperatures. Experimentally relevant observables, such as the double occupancy, compressibility, and entropy per particle are studied in detail.

References:

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