



Diagram analysis of the Hubbard model: Stationarity property of the thermodynamic potential

Moskalenko V. A., Dohotaru L. A., Cebotari I. D.

<https://doi.org/10.1134/S1063776110070095>

Abstract

The diagram approach proposed many years ago for the strongly correlated Hubbard model is developed with the aim to analyze the thermodynamic potential properties. A new exact relation between renormalized quantities such as the thermodynamic potential, the one-particle propagator, and the correlation function is established. This relation contains an additional integration of the one-particle propagator with respect to an auxiliary constant. The vacuum skeleton diagrams constructed from the irreducible Green's functions and tunneling propagator lines are determined and a special functional is introduced. The properties of this functional are investigated and its relation to the thermodynamic potential is established. The stationarity property of this functional with respect to first-order variations of the correlation function is demonstrated; as a consequence, the stationarity property of the thermodynamic potential is proved.