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Kondo hole route to incoherence in the periodic Anderson model[1]

PRAMOD KUMAR, N.S. VIDHYADHIRAJA, Theoretical Sciences Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India 560064 — The interplay of disorder and interactions in strongly correlated electronic systems is a subject of perennial interest. In this work, we have investigated the effect of Kondo-hole type disorder on the dynamics and transport properties of heavy fermion systems. We employ the periodic Anderson model within the framework of coherent potential approximation and dynamical mean field theory. The crossover from lattice coherent behaviour to an incoherent single-impurity behaviour is reflected in all aspects: a highly frequency (ω)-dependent hybridization becomes almost flat, the coherence peak in resistivity (per impurity) gives way to a Hammann form that saturates at low temperature (T); the Drude peak and the mid-infrared peak in the optical conductivity vanish almost completely. The zero temperature resistivity can be captured in a closed form expression, and we show how the Nordheim's rule gets strongly modified in these systems. The thermopower exhibits a characteristic peak, which changes sign with increasing disorder, and its location is shown to correspond to the low energy scale of the system (ω_L). In fact, the thermopower appears to be much more sensitive to disorder variations than the resistivity. A comparison to experiments yields quantitative agreement.

[1]JNCASR and CSIR

Pramod Kumar
JNCASR

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