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Thoery of Charge Order and Heavy-Electron Formation in the Mixed-Valence Compound KNi_2Se_2[1] JAMES MURRAY, ZLATKO TESANOVIC[2], Department of Physics and Astronomy, Johns Hopkins University — The material KNi_2Se_2 has recently been shown to posses a number of striking physical properties, many of which are apparently related to the mixed valency of this system, in which there is on average one quasi-localized electron per every two Ni sites. The material exhibits a charge density wave (CDW) phase that disappears upon cooling, giving way to a low-temperature coherent phase characterized by an enhanced electron mass, reduced resistivity, and an enlarged unit cell free of structural distortion. Starting from an extended periodic Anderson model and using the slave-boson formulation, we develop a model for this system and study its properties within mean-field theory. We find a reentrant first-order transition from a CDW phase, in which the localized moments form singlet dimers, to a heavy Fermi liquid phase as temperature is lowered. The magnetic susceptibility is Pauli-like in both the high- and low-temperature regions, indicating the absence of free local moments, which are typically present in heavy-fermion materials at temperatures above the coherence temperature.

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