CRYSTAL FIELD STATES IN CONDUCTING MAGNETIC MATERIALS: $NdAl_2$, UPd_2Al_3 and $YbRh_2Si_2$

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9.7 cm

There is still a hot debate on the formation and a role of localized crystal-field states in conducting magnetic materials. By years we have pointed out that in metallic compounds localized crystal-field states coexist with conduction electrons. The former are predominantly responsible for magnetic and low-energy spectroscopic properties, the latter for the conduction. In our atomic-start approach to 3d-/4f-/5f-atom containing compounds, being somehow a continuation of Van Vleck's studies, we take into account crystal field and spin-orbit interactions as well as very strong electron correlations. These electron correlations, predominantly of the intra-atomic origin, involving local orbital moment form physical conditions for realization of an anisotropic spin liquid ground state, that, however, in case of atomic-like configuration with an odd number of electrons, is unstable with respect to spin fluctuations for T–>0 K. We take the experimental observation of localized states of UPd_2Al_3 (Prof. Steglich's group in 1996) and recently of a localized Electron-Spin-Resonance signal in $YbRh_2Si_2$ as nice confirmation of our crystal-field-based approach not only to conventional conducting magnetic materials but also to those exhibiting anomalous low-temperature properties, known as heavy-fermion behavior. Influence of CEF states on the magnetism of $NdAl_2$, UPd_2Al_3 and $YbRh_2Si_2$ will be discussed.

13.4 cm

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