

## **Magnetic Properties of Iron**

Alexander Poteryaev

*Institute of Metal Physics, Kovalevskaya 18, Ekaterinburg, Russian Federation*

The properties of iron have fascinated mankind for several thousand years already. Iron has been an exceptionally important material for the development of modern civilization and its technologies. Nevertheless, even today many properties of iron are still not sufficiently understood. Therefore iron remains at the focus of active research. In particular, the problem of origin of magnetism of iron in different phases attracts a lot of attention, despite long time of its investigations. By performing LDA+DMFT calculations in the paramagnetic phase of  $\alpha$ -iron we find that Coulomb interaction and, in particular Hund exchange, yields the formation of local moments in  $e_g$  electron band, which can be traced from imaginary time dependence of the spin-spin correlation function. This behaviour is accompanied by non-Fermi-liquid behaviour of  $e_g$  electrons and suggests using local moment variables in the effective model of iron [1]. In  $\gamma$ -iron, the frequency dependence of the electronic self-energy has a quasiparticle form for both,  $t_{2g}$  and  $e_g$  states, such that local moments are not formed at low temperatures. At the same time, in the temperature range  $T=1200-1500$  K, where  $\gamma$ -iron exist in nature, the effect of weak temperature dependence of local magnetic moments can be observed in the local magnetic susceptibility [2].

- [1] A. A. Katanin, A. I. Poteryaev, A. V. Efremov, A. O. Shorikov, S. L. Skornyakov, M. A. Korotin, and V. I. Anisimov, Phys. Rev. B 81, 045117 (2010).
- [2] P. A. Igoshev, A. A. Katanin, A. I. Poteryaev, A. V. Efremov, and V. I. Anisimov, Phys. Rev. B 88, 155120 (2013).