Abstract

We investigate the competition between superconductivity and ferromagnetism in metallic grains using an effective Hamiltonian that combines a BCS-like pairing term and a Stoner-like spin exchange term. We show that the presence of spin jumps in the ground-state phase diagram is a unique feature of the coexistence of superconducting and ferromagnetic correlations and that this coexistence regime can be made accessible to experiments by tuning an external Zeeman field. We also study the transport properties of an ensemble of chaotic metallic grains in the Coulomb blockade regime and identify signatures of the competition between superconductivity and ferromagnetism in the mesoscopic fluctuations of the conductance.