Abstract Submitted
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Reentrant superparamagnetism induced by spin glass behavior at the surfaces of magnetic nanoparticles[1] WEI QIN, University of Science and Technology of China, XIAOGUANG LI, Fudan University, YI XIE, ZHENYU ZHANG, University of Science and Technology of China — Superparamagnetism appears when the Neel relaxation time of magnetic nanoparticles is shorter than the measurement time. Recent experimental studies of different types of magnetic nanoparticles revealed that superparamagnetic transitions could also take place below the blocking temperatures [1-3], an intriguing phenomenon tentatively termed as quantum superparamagnetism. Here we elucidate the microscopic origin of the reentrant superparamagnetism in such systems using a phenomenological model, which emphasizes the dynamical coupling between the ferromagnetic core and the spin glass surface layer of a given nanoparticle [4]. We first obtain expressions for the thermal relaxation of the total magnetization of the particle upon finite-field and zero-field cooling, then carry out numerical simulations using physically realistic materials parameters. Our findings provide a more plausible interpretation of the observed reentrant superparamagnetism beyond the previous macroscopic quantum tunneling picture.

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