Low temperature magnetic relaxation and quantum tunneling in nanocrystalline particles (abstract)

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We report measurements of the magnetic relaxation rate versus temperature for ferrofluid and magnetic-glass samples, which are formed by a modification of nanocomposite material consisting of nanocrystalline $CoFe_2O_4$ and polymer.[1] The magnetic properties of the samples have also been studied by using SHE-SQUID at different temperatures (1.8–300 K) with low and high applied magnetic field (−5 T to 5 T). The magnetic relaxation in two samples show a perfect logarithmic dependence on the time, i.e., $M(t)=M(t_0)[1-S\ \ln(t/t_0)]$, in accordance with the ZFC-FC results which indicate that there is wide energy distribution. The temperature independence of magnetic viscosity $S\equiv[1/M(t_0)dM/d]\ln t$ below several Kelvin for the two samples gives clear evidence of macroscopic quantum tunneling of magnetization, in accordance with current theories of quantum tunneling of magnetization. © *1996 American Institute of Physics.* [S0021-8979(96)70108-6]

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[1]R. F. Ziolo *et al.*, Science **257**, 219 (1992).

 0021-8979/96/79(8)/6116/1/$10.00