MAR05-2004-006337

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Photon-Induced Magnetization Reversal in Single Molecule Magnets

MUSTAFA BAL[1], Amherst College

Single-molecule magnets (SMM) have been the subject of intensive research for more than a decade now because of their unique properties such as macroscopic quantum tunneling. Recent work in this area is focused on whether SMM are potential qubits, as proposed theoretically [1]. We use continuous millimeter wave radiation to manipulate the populations of the energy levels of a single crystal molecular magnet Fe_8 [2]. When radiation is in resonance with the transitions between energy levels, the steady state magnetization exhibits dips. As expected, the magnetic field locations of these dips vary linearly with the radiation frequency. We will describe our experimental results, which provide a lower bound of 0.17 ns for transverse relaxation time. Transitions between excited states are found even though these states have negligible population at the experimental temperature. We find evidence that the sample heating is significant when the resonance condition is satisfied. Recent experiments are concentrated on the spin dynamics of Fe_8 induced by pulsed radiation and results of these studies will also be presented. [1] Leuenberger, M. N. and Loss, D., Nature 410, 789 (2001). [2] M. Bal et al., Phys. Rev. B 70, 100408(R) (2004).

[1]In collaboration with Jonathan R. Friedman, Y. Suzuki, K. Mertes, E. M. Rumberger, D. N. Hendrickson, Y. Myasoedov, H. Shtrikman, N. Avraham, and E. Zeldov