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Spin Lattice Relaxation as a Probe of Carrier Dynamics in Conducting Polymer Poly-3-methyl-thiophene GERARD GAIDOS, W.G. CLARK, S.E. BROWN, University of California, Los Angeles, REGHU MENON, Indian Institute of Science, Bangalore — Measurements of the proton spin lattice relaxation rate ($1/T_1$) in the conducting polymer poly-3-methyl-thiophene doped with PF_6 are reported over the temperature (T) and magnetic field (B_0) ranges 2-300 K and 0.9-9.0 T respectively. They yield information regarding local magnetic fluctuations from charge carrier dynamics. Their dependence on T and B_0 deviate from the Korringa law for $1/T_1$ in metals. Below 35 K, two values for $1/T_1$ are observed. At higher T, a more uniform relaxation is observed. These results suggest that localized and itinerant electrons are present in different regions of the sample, depending on T and the degree of sample disorder. This interpretation is further supported by magnetic susceptibility measurements, which demonstrate Fermi glass behavior at low T. From these $1/T_1$ measurements, the disordered fraction of our samples is obtained. This work was supported by NSF Grants DMR-0334869 and INT-0225578 (WGC), and DMR-0203806 (SEB).

Gerard Gaidos

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