

Abstract Submitted
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NMR, magnetic susceptibility, and electrical conductivity investigation of doped poly-3-methylthiophene¹ W.G. CLARK, G. GAIDOS, UCLA Physics and Astronomy, K.J. SINGH, R. MENON, K.P. RAMESH, Physics, IISc Bangalore, India, A.P. REYES, P. KUHN, NHMFL, Tallahassee, FL, J.D. THOMPSON, LANL, Los Alamos, NM — We report ¹H and ¹⁹F NMR spin-lattice relaxation rate ($1/T_1$) measurements over a wide range of temperature ($3\text{ K} < T < 300\text{ K}$) and magnetic field ($0.9\text{ T} < B < 23.4\text{ T}$ for ¹H and 9.0 T for ¹⁹F) in the organic conductor poly-3-methylthiophene (P3MT) doped with hexafluorophosphate (PF₆). Also included are measurements of the electrical conductivity (σ) at $B = 0$ and $77\text{ K} < T < 300\text{ K}$ and the magnetic susceptibility (χ) at $B = 0.1\text{ T}$ and $2\text{ K} < T < 350\text{ K}$. The doping level has been varied to tune the conductivity value at 300 K in the fully doped sample to $\sigma \sim 120\text{ S/cm}$ and in the dedoped one to $\sigma \sim 5\text{ S/cm}$. This range enables investigation of the roles of carrier density and electron-electron interactions in the mechanisms for $1/T_1$. A correlation between χ and the relaxation mechanisms is observed in these samples. The results are analyzed using the modified Korringa relation. Also, the proton and fluorine spin relaxation data give insight into the role of both inter-chain and intra-chain conduction mechanisms.

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