NMR investigation on quasi-one-dimensional purple bronze Li$_{0.9}$Mo$_6$O$_{17}$

GUOQING WU, Physics, U. of West Florida, W.G. CLARK, S.E. BROWN, Phys. & Astron., UCLA, J.J. NEUMEIER, Physics, Montana State U., C.A.M. DOS SANTOS, EEL-U. São Paulo, J. MARCUS, Institut Néel, Grenoble, C. BERTHIER, M. HORVATIC, LNCMI, Grenoble — $^7$Li-NMR measurements are reported for a single crystal of quasi-1D conductor Li$_{0.9}$Mo$_6$O$_{17}$ (lithium purple bronze) as a function of temperature ($T$) and applied magnetic field ($B_0$). The $^7$Li-NMR spin-lattice relaxation rate ($1/T_1$) follows a Korringa relation above $\sim 50$ K and has surprising features at lower $T$ with $6 T \leq B_0 \leq 12$ T. This behavior indicates a conventional electron motion in the high $T$ metallic state with a change at lower $T$ in the electron density of states and perhaps the correlation time. A similar behavior is also shown by $^{95}$Mo $1/T_1$ measurements made at 14.8 T. The $^7$Li-NMR spectra also show a significant inhomogeneous broadening and frequency shift across the temperature ($T_{\text{min}}$) where the resistivity exhibits a minimum. This indicates a substantial local field change below $T_{\text{min}}$. A possible scenario for the development of a field induced spin-density wave state is discussed. Noticeably, these are challenging experiments due to the long $^7$Li spin-lattice relaxation time ($T_1$) and small natural abundance of $^{95}$Mo in the material. It is the first reported NMR measurement for the material. This work was supported at UCLA by NSF Grants DMR-0334869 and DMR-0520552, and at MSU by NSF Grant DMR-0907036.

Guoqing Wu
Physics Department, University of West Florida

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