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^{7}Li NMR Study of Magnetic Defects in Heavy Fermion LiV_2O_4[1]

X. ZONG, D.C. JOHNSTON, F. BORSA, S. DAS, J. SCHMALIAN, Ames Lab. and Dept. Phys. Astron., Iowa State U., Ames, IA 50011 — A small concentration ($n \approx 0.7$ mol%) of magnetic defects within the normal spinel structure of heavy fermion LiV_2O_4 was recently found to have a strong effect on the ^{7}Li NMR at low temperatures $T < 4.2$ K.(1) The ^{7}Li nuclear magnetization relaxation versus time after saturation, $M(t)$, changed from a pure exponential in a pure sample with $n = 0.01$ mol% to a stretched exponential for $n = 0.7$ mol%. Here we present a systematic study of the variations of the ^{7}Li NMR versus n for additional n values from 0.05 to 0.8 mol%. Non-exponential $M(t)$ recovery was consistently obtained for samples with $n \geq 0.2$ mol% and the nuclear spin lattice relaxation rate versus temperature evolved monotonically with increasing n, consistent with the interpretation in Ref. (1). In addition, we obtained relaxation data for much shorter times than studied in Ref. (1), which indicate a previously unknown initial $M(t) \propto \sqrt{t}$ dependence for all samples with $n \geq 0.5$ mol%, for times $t < 20$ ms. At present, there exists no microscopic theory for the influence of magnetic defects on our ^{7}Li NMR results. Phenomenological models that may help to understand the data will be discussed.
(1). D. C. Johnston et al., Phys. Rev. Lett. **95**, 176408 (2005).

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