

NMR Studies of ^3He Impurities in ^4He in the proposed Supersolid Phase

S. S. Kim^a, C. Huan^a, L. Yin^a, J. S. Xia^a, D. Candela^b, and N. S. Sullivan^a

^aPhysics Department, and Microkelvin Lab, NHMFL, University of Florida, Gainesville, FL 32611, USA

^bPhysics Department, University of Massachusetts, Amherst, Massachusetts 01003, USA

Preliminary results are reported for measurements of the NMR relaxation times of very dilute ^3He in samples of solid ^4He in the region where a supersolid phase¹ has been reported. The results were obtained for carefully prepared samples with different ^3He concentrations. The measurements of the spin-spin relaxation time, T_2 , show several interesting features. A temperature independent plateau attributed to the exchange motional narrowing is observed down to the lowest temperature studied, and the observed variation of T_2 with ^3He concentration favors the nonlinear theory suggested by Landesman². The best fit is given by $T_2 \propto x_3^{-1.6 \pm 0.2}$ rather than x_3^{-1} . No evidence of an exchange-phonon bottleneck for the spin-lattice relaxation is seen down to 40mK. The vacancy activation energy is determined as 13.5K for a sample with $x_3 = 5 \times 10^{-4}$ and molar volume of 20.9 cm³.

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2. Landesman, A. (1975). "Theory of magnetic relaxation for dilute ^3He atoms tunneling in hcp solid ^4He ". *Phys. Lett.* **54A**,137

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