Temperature Dependent Structure of Isolated $^8Li^+$ in Al

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A low energy beam of spin polarized $^8Li^+$ has been used to study the behaviour of isolated $^8Li^+$ implanted into a 150 nm thick film of high purity Al on an MgO substrate. The nuclear spin relaxation rate $1/T_1$ and β-NMR resonance lineshape were measured as a function of temperature in a large magnetic field of 4.1 T. The behaviour of $1/T_1$ versus temperature shows evidence for a transition between the octahedral and substitutional sites at about 100 K, as observed in other fcc metals (see Figs. 1a and 1b). The resonances for the two sites are unresolved due to the small difference in Knight shifts and large nuclear dipolar interaction with the host ^{27}Al dipole moments. Nevertheless, the temperature dependence of the resonance linewidth and its average position confirm a transition at around 100 K. Below 50 K there is evidence for a peak in the Korringa relaxation rate (see Fig. 1b), possibly arising from a third high symmetry site that has not been observed in other fcc metals thus far.

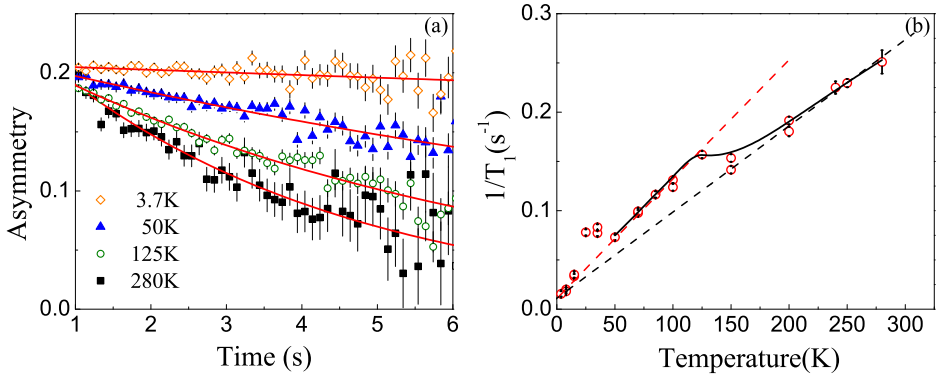

Fig. 1: (a) Spin relaxation of $^8Li^+$ in 150 nm Al/MgO at various temperatures. (b) Spin relaxation rate of $^8Li^+$ in Al versus temperature.