Lattice Relaxation in Solid ^{4}He — Effect on Dynamics of ^{3}He Impurities

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We review the effect of lattice relaxation that accompanies the quantum tunneling of ^{3}He impurities in solid ^{4}He on the nuclear spin-lattice relaxation of the ^{3}He impurities for very low impurity concentrations. As a result of the larger zero point motion of the ^{3}He impurity compared to the ^{4}He atoms, a significant lattice distortion accompanies the impurity as it moves through the lattice and the dynamics of the impurity depends on both the interaction energy between two ^{3}He atoms and on the relaxation of the lattice for the tuneling impurity. Using a phenomenologiocal model for the lattice relaxation we compare the observed nuclear spin-lattice relaxation rates observed at low temperatures with the dependence on temperature expected for a ^{4}He lattice relaxation comparable to that observed by Beamish *et al.*[1]

1. O. Syshchenko, O., Day, J. and Beamish, J. Phys. Rev. Lett. **104**,195301 (2009).

Section: QS - Quantum solids

Keywords: lattice relaxation, nuclear spin-lattice, tunneling