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The Lattice Dynamics of Mercuric Chloride

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Abstract content
 (Max 300 words)

Measurements of the nuclear spin-lattice relaxation time (T_1) of the Cl nuclei in a high purity sample of the molecular solid mercuric chloride (HgCl_2) have been made over the temperature range 4 K - 500 K using pure nuclear quadrupole resonance. Spin-lattice relaxation in this material appears to be dominated by lattice vibrations and librations over the entire temperature range investigated. Analysis of the data using available spin-lattice relaxation models has allowed us to estimate the Debye temperature and to follow changes in the lattice dynamics as a function of temperature. At high temperatures (> 350 K) deviations from the expected quadratic relationship between the spin-lattice relaxation rate and temperature have been noted. Further analysis shows this is a thermally activated process. Related changes in the resonance lineshape in this temperature range provide strong evidence of a double potential well in which the nuclei move between two energetically similar positions.

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