

^1H NMR Study of Proton Dynamics in the Ferroelastic Transition of $\text{K}_4\text{LiH}_3(\text{SO}_4)_4$ Single Crystal

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$\text{K}_4\text{LiH}_3(\text{SO}_4)_4$ is known to show a ferroelastic transition at $T_c = 114$ K. We have performed ^1H nuclear magnetic resonance (NMR) measurements to investigate proton dynamics in the phase transition of $\text{K}_4\text{LiH}_3(\text{SO}_4)_4$ crystals in the temperature range of 80-300 K at 2.68 T. The ^1H NMR spectrum shows a composite structure with dominating broad and weak narrow components. The broad component has an extremely long T_1 whereas the narrow component exhibits a short T_1 at room temperature. The intensity of the narrow peak decreases at low temperature vanishing below 200 K. From this behavior, we find that the narrow component comes from rapidly moving protons whereas the broad component originates from rigid protons. From the temperature dependence of the short T_1 for the narrow component, the activation energy for the proton's rapid motion is deduced to be ~ 1900 K. On the other hand, the long T_1 for the broad component increases rapidly at low temperature suggesting that the proton dynamics associated with the ferroelastic transition change abruptly across T_c .