

μ SR study of spin dynamics in LiY_{1-x}HoxF₄

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Abstract

We present zero-field positive muon spin relaxation (μ SR) measurements for LiY_{1-x}HoxF₄ samples with $x = 0.0017, 0.0085, 0.0406, \text{ and } 0.0855$. We characterize the dynamics associated with the formation of the (F- μ -F)- complex by comparing our data with Monte Carlo simulations to determine the concentration range over which the spin dynamics are determined primarily by the Ho³⁺- μ interaction rather than by the F- μ interaction. Simulations show that F- μ -F oscillations should evolve into a Lorentzian Kubo - Toyabe decay for an increasing static magnetic field distribution Γ (i.e., increasing x), but the data do not show this behavior, consistent with the recently reported existence of strong magnetic fluctuations in this system at low temperatures. Anisotropy in the field distribution is shown to cause small errors of the order of 10% from behavior predicted for an isotropic distribution. Finally, numerical calculations show that values of Γ calculated in the single-ion limit greatly exceed the values extracted from curve fits, suggesting that strong correlations play an important role in this system. © 2011 American Physical Society.

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