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CdEr₂Se₄: A new erbium spin ice system in a spinel structure

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Abstract

Here we present a detailed study of the spinel CdEr₂Se₄ and show it to be a new instance of spin ice, the first one in an erbium material and the first one in a spinel. Definitive experimental evidence comes from the temperature dependence of the magnetic entropy, which shows an excellent agreement with the predicted behavior for a spin ice state. Crystal field calculations demonstrate that the change in the local environment from that of the titanates completely alters the rare-earth anisotropy giving rise, in the case of Er³⁺, to the required Ising anisotropy, when Er₂Ti₂O₇ behaves as an XY antiferromagnet. This finding opens up the possibility of new exotic ground states within the CdR₂Se₄ and CdR₂Se₄ families. © 2010 The American Physical Society.

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