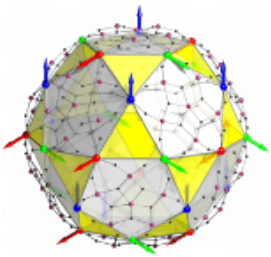

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Mechanism of the Magnetocaloric Effect in the Mn5-xFexSi3 Series

Tuesday 4 June 2019 15:15 (30 minutes)

Due to potential energy savings for room temperature applications, the magnetocaloric effect (MCE) has attracted increasing interest in the past years. We have performed extensive studies of structure, magnetism, magnetocaloric effect and spin dynamics in the Mn5-xFexSi3 series of compounds [1-5]. While the magnetocaloric effect is moderate for these compounds, they are composed of abundant and non-toxic elements and can be grown as large single crystals. This allows us to perform inelastic neutron scattering studies of the spin and lattice dynamics thus giving insight into the microscopic mechanism of the MCE. For the compound MnFe4Si3 a strong response of the critical fluctuations has been detected and identified as an important feature connected to the MCE effect [4]. The compound Mn5Si3 exhibits an inverse magnetocaloric effect. Inelastic neutron scattering reveals that contrary to the intuitively expected behavior, the application of a magnetic field can induce additional spin fluctuations giving rise to an increase of the magnetic entropy. This mechanism provides a microscopic explanation of the inverse magnetocaloric effect [5].

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[3] P. Hering et al; Chemistry of Materials 27 (2015), 7128
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