Magneto-structural Phenomena in Hydrides with Unusual Topology of Spin Lattice

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Recently, we found highly unusual coupling between the magnetic and chemical (hydrogen) orderings in the hexagonal Laves hydrides RMn_2H_x (R=Er, Tm and Lu; $2<x<4.6$). RMn_2 compounds have very unusual topology of the Mn-sublattice resulting in a fully degenerated magnetic ground state. Tiny modifications of the H-superstructure can stabilize or destroy different types of magnetic orderings. The magneto-structural coupling results in oscillating dependence between the magnetic and structural ordering parameters. While the H-sublattice becomes gradually more ordered as the H density increases, the correlation length in the magnetic sublattice shows an oscillating dependence with H content [1]. The key role of the H-superstructure in formation of magnetic ordering manifests by strong sensitivity of magnetic and structural properties to applied pressure. In $RMn_2H_{4.6}$ small applied pressure (0.6GPa) sets the new arrangement of the H atoms. Changes in local environment of the magnetic atoms result in the suppression of the long-range magnetic order in the high-pressure phase [2]. Another intriguing phenomena were found near the frontier between localized and intrinsic magnetic states of Mn-sublattice in the low-content hydrides $(Er_xLu_{1-x})Mn_2H_3$ ($0<x<1$). We observed giant magnetovolume effect ($\delta V/V=2.5\%$) and unusual phase decoupling, involving antiferromagnetic domains with different wave vectors.

[1] Makarova O.L., Goncharenko I. N., Bouree F., *Phys. Rev. B*, 2003, **67**, 134418. [2] Makarova O.L., Goncharenko I.N., Le Bihan T., *Solid State Com.,* 2004, **132**, 329.

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