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Abstract Claudia Felser:

Heusler compounds for permanent magnets

Heusler compounds are a remarkable class of materials with more than 1,000 members and a wide range of extraordinary multifunctionalities [1]. The tunabilty of this class of materials is exceptional and nearly every functionality can be designed [2]. The magnetic coupling in Cobalt, Iron, and Manganese X2YZ Heusler compounds is strong and high Curie temperature far above room temperature up to 1200 K can be observed. In 2007 Mn3-xGa was identified as a material with a high magnetocrystalline anisotropy [3], the recondition for a large coercitive field. In general Manganese-rich Heusler compounds are attracting much interest in the context of materials with large spin transfer torque, spin Hall effect, non collinear magnetism and rare-earth free hard magnets. Here we give a comprehensive overview of the magnetic properties of Heusler materials with a large magneto crystalline anisotropy, precondition for a large figure of merit (BH product) [4,5]. Tetragonal Heusler compounds with large magneto crystalline anisotropy can be easily designed by positioning the Fermi energy at the van Hove singularity in one of the spin channels. The Mn3+ ions in Mn2YZ cause a Jahn Teller distortion [4,5]. The second condition for a large BH product is a large moment, but most of the materials tend to order ferrimagnetic or non collinear [6,7]. Design principles and new directions will be discussed. [1] C. Felser, et al, Angewandte Chemie, Interna. Ed. 46 668 (2007).

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