



CRC/TRR 270

HoMMage



UNIVERSITÄT
DUISBURG
ESSEN

Offen im Denken

Hysteresis Design of Magnetic Materials for Efficient Energy Conversion

Tuesday, 30 January 2024, 9:00 s.t., UDE, via Zoom



Prof. Preeti Anand Bhobe

Department of Physics,

IIT Indore, India

Complex magnetic ground states of some reversed Heusler alloys

Abstract:

A great deal of research has been focused on studies of the Heusler compositions by selecting non-traditional chemical formulations with a 2:1:1 ratio for their multi-functional properties. To access a compound's potential, we must know its fundamental properties- like its structure, antisite defects and various transport properties. The present study reports the correlation between structural and magnetic degrees of freedom of some unorthodox, novel Mn-based Heusler alloys with chemical formula Y_2XZ and Z_2XY , using synchrotron X-ray diffraction, neutron diffraction, X-ray absorption fine structure, and detailed magnetic and transport measurements. These new reversed Heusler alloys have base compositions as, Ga_2MnCo , Mn_2FeSi and exhibit cluster-glass type magnetic state despite displaying a well-ordered structure in XRD. Such a phase unraveled here for the first time, is unconventional as it occurs in compounds with a fairly simple, stable structure without any apparent geometric frustration. After careful analysis of the local structure through XAFS, we find the structural intricacies: a significant local lattice disorder, inhomogeneities and anti-site defects, that acts as a precursor of the glassy magnetic state. The erratic structural order of these compositions raises the question of whether or not we should classify them as Heusler alloys.

References:

- [1] K. Mishra et al., J. Alloys. Compds. 970, 172611 (2023)
- [2] T. Samanta et al., J. Phys. Chem. C 126, 17670 (2022)
- [3] S. Chaudhuri et al., Sci. Rep. 11, 524 (2021)
- [4] T. Samanta et al., Phys. Rev. B, 97 184421 (2018)

About the speaker:

Dr Preeti A. Bhobe is an experimental condensed matter physicist. She earned her PhD degree from Goa University, Goa India, where she studied the martensitic transitions in Ni-Mn-Ga using X-ray Absorption Fine Structure spectroscopy. Subsequently, as a postdoctoral fellowship at Tata Institute of Fundamental Research, Mumbai she investigated the magneto-caloric effect in Heuslers.

She was then awarded the JSPS postdoctoral fellow at the ISSP, University of Tokyo, where she worked at Spring-8 synchrotron source, investigating the unconventional metallic ground state in the antiferromagnetic oxides and nitrides through Photoemission spectroscopy.

She joined IIT Indore as an Assistant Professor in December 2011 and currently is a Professor & Head of the Physics Department. She has active research collaborations at the Texas A&M University, USA, DESY synchrotron source, Hamburg and Leibniz University of Hannover, in Germany.

At present, her research interests comprise functional materials like Half-metals and Topological states in Heuslers, Spin-glasses, and Magneto-transport in 2D Chalcogenides.

CRC/TRR 270 • Technische Universität Darmstadt and Universität Duisburg-Essen
Spokesperson: Prof. Dr. Oliver Gutfleisch • Co-Spokesperson: Prof. Dr. Michael Farle
Management: Dr. Sonja Laubach • L2|07 107 • sonja.laubach@tu-darmstadt.de • +49 (0)6151 16-22153
Address: CRC/TRR 270 • TU Darmstadt • Peter-Grünberg-Str. 16 • 64287 Darmstadt