Magnetic structures and magnetoelastic effect in $R_5Pt_2In_4$ (R = Tb–Tm) investigated by neutron powder diffraction

A. Deptuch,[1] S. Baran,[2] A. R. Hayyu,[3,2] L. Keller,[4] and A. Szytuła[2]

[1] *Institute of Nuclear Physics Polish Academy of Sciences, Radzikowskiego 152, PL-31-342 Kraków, Poland*

[2] *Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science, M. Smoluchowski Institute of Physics, prof. Stanisława Łojasiewicza 11, PL-30-348 Kraków, Poland*

[3] *Jagiellonian University, Doctoral School of Exact and Natural Sciences, Faculty of Physics, Astronomy and Applied Computer Science, prof. Stanisława Łojasiewicza 11, PL-30-348 Kraków, Poland*

[4] *Laboratory for Neutron Scattering and Imaging, Paul Scherrer Institut, 5232 Villigen PSI, Switzerland*

The $R_5Pt_2In_4$ (R = Tb–Tm) rare earth intermetallic compounds have complex and intriguing magnetic properties. The compounds crystallize in an orthorhomic crystal structure with the rare earth atoms occupying three different sublattices. Magnetic measurements indicate either ferri- or antiferromagnetic order below the critical temperatures between 4.1 K (R = Tm) and 108 K (R = Tb) [1]. Our recent neutron diffraction data reveal that the rare earth magnetic moments in two sublattices order at the critical temperature of magnetic ordering while the moments in the third sublattice order at lower temperatures. Such a sequence of magnetic transitions effects strongly temperature dependences of the lattice parameters and unit cell volume. For all compounds, a distinct jump of the above mentioned parameters is observed at the respective critical temperature. The corresponding magnetovolume effects are strongly correlated with the magnitudes of rare earth magnetic moments. At lower temperatures only small anomalies, related to the magnetic ordering in the third sublattice, are visible.

References:

[1] A. R. Hayyu, S. Baran, A. Szytuła, Characterization of magnetic properties, including magnetocaloric effect, of $RE_5Pt_2In_4$ (RE = Gd–Tm) compounds, arXiv:2212.07171 [cond-mat.mtrl-sci], https://doi.org/10.48550/arXiv.2212.07171