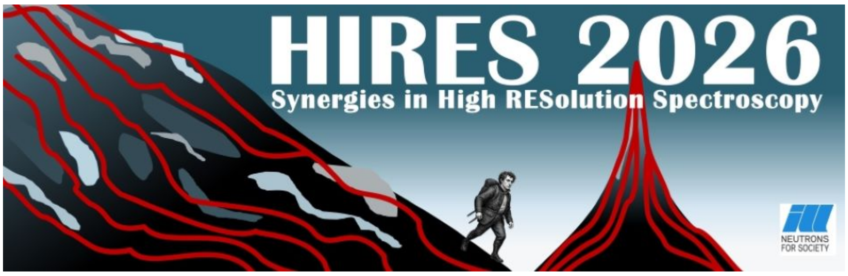

Contribution ID: **13**

Type: **Poster**

Promising features of praseodymium nanoferrites

Praseodymium-doped magnetite ($\mathrm{Pr_xFe_{3-x}O_4}$, $x = 0.15$ and 0.45) was synthesized by co-precipitation from chloride precursors to investigate the influence of lanthanide substitution on structural and magnetic properties. Both compositions crystallize in a mixed spinel structure, space group Fd-3m (no. 227), and exhibit single-phase character, as confirmed by powder X-ray diffraction. Refined lattice parameters are 8.392(2) Å for $\mathrm{Pr_{0.15}Fe_{2.85}O_4}$ and 8.388(2) Å for $\mathrm{Pr_{0.45}Fe_{2.55}O_4}$, indicating slight lattice contraction with increasing Pr content. Average particle size ranges from 24 nm ($\mathrm{Pr_{0.15}Fe_{2.85}O_4}$) to 17 nm ($\mathrm{Pr_{0.45}Fe_{2.55}O_4}$). Mössbauer spectroscopy revealed modifications in the $\mathrm{Fe^{2+}/Fe^{3+}}$ ratio, suggesting partial occupation of tetrahedral and octahedral sites by $\mathrm{Pr^{3+}}$ ions and changes in the local electronic configuration. Magnetization measurements confirmed ferrimagnetic behavior with negligible coercivity and stable magnetic ordering up to room temperature. These results indicate Pr substitution alters the $\mathrm{Fe^{2+}/Fe^{3+}}$ balance, inducing deformation of oxygen polyhedra and increased magnetic anisotropy. The obtained Pr-doped $\mathrm{Fe_3O_4}$ nanomaterials combine soft magnetic characteristics with strong potential for environmental remediation, enabling efficient adsorption of heavy metal ions and degradation of organic pollutants, while magnetic separability allows recovery and reuse. Thus, Pr-substituted magnetite is a promising class of eco-efficient nanomaterials for catalytic, magnetic, and wastewater treatment applications.

Session

Materials Science

Primary authors: Ms SZARKOWSKA, Kinga (University of Białystok); Dr KLEKOTKA, Urszula (University of Białystok); Dr OLSZEWSKI, Wojciech (University of Białystok); Ms BIERNACKA, Maria (University of Białystok); Prof. REĆKO, Katarzyna (University of Białystok)

Presenter: Ms SZARKOWSKA, Kinga (University of Białystok)

Session Classification: Materials Science