Nanostructured materials | Jožef Stefan Institute Ljubljana, Slovenia

SEMINAR - I

Friday, 7.6.2024, 13:15, IPS lecture room

Grain Boundary Engineering of Nanocrystalline Nd-Fe-B Permanent Magnets for High-Energy Applications

Sana Shaukat

This seminar explores recent advancements in nanostructured permanent magnet materials through the various processing methods and sintering techniques employed for their fabrication. Beginning with an overview of the intrinsic and extrinsic properties of permanent magnets, the discussion delves into the historical perspective of permanent magnet technology, highlighting the evolution of magnetic materials over time. The study aims to determine whether the coercivity mechanism is based on nucleation reversal or pinning reversal. The modification of grain boundaries and interfaces using different grain boundary modifiers is explored to enhance magnetic properties. Heavy rare earth elements and low eutectic alloys such as Nd-Cu and Pr-Cu are evaluated for their effects on magnetocrystalline anisotropy and grain boundary wetting, respectively. Additionally, resource efficiency is addressed by substituting Nd in the grain boundary phase with more abundant elements. Fast consolidation methods, including spark plasma sintering (SPS) and radiation sintering, are utilized to achieve dense and uniform nanocrystalline structures while minimizing grain growth. This research provides insights into the mechanisms governing coercivity in HDDR-processed Nd-Fe-B materials and highlights the potential of tailored sintering techniques to enhance magnetic properties. The findings contribute to the development of advanced permanent magnets with high coercivity and remanence, meeting the demands of modern technological applications.

Kindly invited.