Poster | Raw materials

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[P2] Raw Materials & Recycling

Session Chair: Mr. Johann Fischbacher (University for Continuing Education Krems, Austria), Dr. Yusuke Hirayama (AIST, Japan)

[P2-20] Metallothermic Reduction of Neodymium chloride: A Strategic Route for High-Purity Neodymium Metal for NdFeB Magnets

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Neodymium (Nd) is a critical metal with extensive applications in green technologies. This study focuses on producing high-purity neodymium metal through the metallothermic reduction process. The method begins with the conversion of neodymium oxide (Nd_2O_2) to neodymium chloride ($NdCl_3$) using ammonium chloride (NH_4Cl) as a chlorinating agent. The resulting NdCl3 is then reduced to metallic neodymium using calcium as the reductant. To prevent oxidation, the reduction process was carried out in a controlled argon (Ar) atmosphere using an inert crucible setup. Optimal chlorination conditions were established to obtain high-purity $NdCl_3$. Then the metallothermic reduction process carried out extensively to determine the parameters for maximizing yield and purity. The obtained neodymium metal was characterized using X-ray diffraction (XRD), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDS) to analyze its phase purity, surface morphology, and elemental composition. Prior to refining, the technique effectively produced neodymium metal with an initial purity of 97%. These findings demonstrate the approach's potential for producing high-purity neodymium for advanced applications such as electric vehicles (EVs), magnet production, and other high-tech sectors.