Leaching Kinetics of Neodymium in Sulfuric Acid from E-Scrap of NdFeB Permanent Magnet

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A leaching of neodymium in NdFeB permanent magnet powder was carried out for the purpose of recovery of neodymium in sulfuric acid (H_2SO_4) from E-scrap (electric scrap) of NdFeB permanent magnet powder as a reactant. The reaction conditions are as follows; H_2SO_4 concentration from 2.5 to 3.5 M, pulp density of 110.8 g/L, agitation of 750 rpm and the range of temperature from 30 to 70℃. On the basis of the shrinking core model with the shape of sphere, the leaching mechanism of neodymium was determined by ash layer diffusion rate determining step. Generally, it was known that the solubility of pure rare earth elements in H2SO4 is decreased with the increase of leaching temperatures. However, in this study, the leaching rate of neodymium existing in the E-scrap powders was oppositely increased with the increase of leaching temperatures. This reason was that unreacted ash layer included in the E-scrap powder was acted as a resistance against the leaching. By using the Arrhenius expression, the apparent activation energy values were determined to be 2.26 kJmol-1 at 2.5 M H_2SO_4 and 2.77 kJmol-1 at 3.0 M H_2SO_4.