

Direct Reuse of Rare Earth Permanent Magnets – Coating Integrity

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Rare earth permanent magnets can be reused directly as an alternative to traditional recycling methods, in which scrapped magnets are re-processed into new magnets by undergoing many of the original energy-intensive and expensive production processes. Direct reuse entails using segmented magnet assemblies built by several small standard-sized magnets that can be reused directly in a number of different applications. A central part of the direct reuse strategy is to separate and demagnetize magnets by heating them to the Curie temperature. We investigated the validity of direct reuse as a rare earth magnet recycling strategy by evaluating the extent to which the heat-driven demagnetization cycles affected magnetic properties, as well as the integrity of the protective coating of Nd-Fe-B magnets. The experimental investigation consisted of four different tests, and was applied to 300 magnets that had either been heated once, five times, or none at all. The tests included J-H measurements, coating pull-off test, corrosion salt spray test, and optical microscopy of the interface between coating and magnet. Magnets coated with Zn, Epoxy, Ni-Cu-Ni, and Ni-Cu+Epoxy were investigated, of which Ni-Cu+Epoxy showed no degradation after heat treatment. Direct reuse as a recycling strategy could therefore be a valuable alternative to traditional recycling.

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