

Recovery of high coercivity from the powder obtained by crushing Nd-Fe-B sintered magnet scraps

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As an effort to preserve the environment, many studies have been tried to recycle the abandoned Nd-Fe-B sintered magnets. While some studied on the extraction of Nd from the Nd-Fe-B sintered magnet scraps, others studied on the conversion of the sintered magnet scrap into the powder for bonded magnets. Although the latter seems to be the best way to recycle the Nd-Fe-B sintered magnet scraps in an economical sense, it has never been used in production and conclusively failed mostly due to severe loss of coercivity after comminution of the Nd-Fe-B sintered magnet scraps. The aim of the present study is, therefore, to develop high coercive magnetic powders for bonded magnets from the Nd-Fe-B sintered magnet scraps.

Generally, as mentioned above, coercivity of the powder is significantly lost through crushing of the Nd-Fe-B sintered magnet (Fig. 1). However, it was found that the coercivity of the powder could be fully restored by a proper surface treatment (Fig. 1). The powder surface and grain boundaries were modified with some additives by thermal activation. An anisotropic powder obtained from the Nd-Fe-B sintered magnet scrap exhibited $B_r = 11.6$ kG, $iH_c = 13.3$ kOe, and $(BH)_{max} = 31.1$ MGOe. The magnetic hardening mechanism of the restored powder and its manufacturing process will be described in detail.

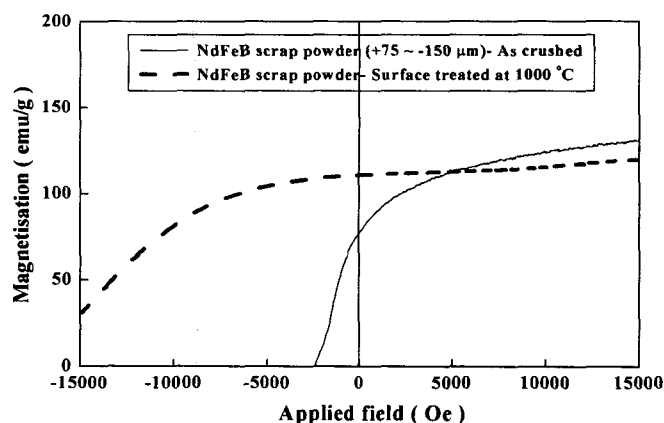


Fig.1 Demagnetization curves of crushed NdFeB scrap powder and surface treated powder.