Critical Issues for High Performance Hexaferrite Permanent Magnets

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Recently, industrial demands on high performance rare earth and ferrite magnets are continuously increasing for their diverse applications such as automobiles, household appliances, medical equipments, and etc. To achieve high maximum energy product (BH)max, both remanence Br and coercive field Hc should be large. While the Br value is an intrinsic property dependent upon the components of the magnet compounds, the Hc value is an extrinsic property sensitive to relative density, grain size and shape, and grain alignment of magnets which are determined by the fabrication processing parameters. The Nd-Fe-B permanent magnets currently exhibiting the highest performance are being utilized as various motors including driving motor of the hybrid electric automobile. However, because of a recent abrupt increase in the cost of rare earth elements, world-wide R&D activities are under progress to develop cost-effective new materials. One of such efforts is to improve the performance of hexaferrites. Although *M*-type hexagonal ferrites such as $BaFe_{12}O_{19}$ and $SrFe_{12}O_{19}$ exhibit the (BH)max value of around 3~4.5MGOe, and thus those are applicable to the motors for laundry machine and for the fuel pump and starter of automobiles, further improvement in their performance is highly required for wider replacement of the rare earth magnets. In this presentation, I will discuss the critical issues to improve the performance of hexaferrites.