

Development of high performance anisotropic magnetic powders for bonded magnets

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The preparation of high-performance anisotropic magnetic powder is the key to obtain high-performance bonded magnets. In this talk, I will report the research results of our group on anisotropic permanent magnetic powders and magnets. By using neutron diffraction, magnetic measurement, electron microscopy, and other techniques combined with the electronic structure calculation, the relationship between the structure and magnetic properties of magnetic materials was investigated. The physical roots of the interstitial atom effect to improve the magnetic properties of the material are clarified, and the preparation of defect-free single-crystal-like particles is proposed to synthesize high-performance magnets powders. Based on the technical route of anisotropic permanent magnetic powder, the key technologies and equipments for the industrialization of high-performance anisotropic $\text{Sm}_2\text{Fe}_{17}\text{N}_x$ and $\text{Nd}(\text{Fe},\text{M})_{12}\text{N}$ magnetic materials and magnets have been developed. We also investigated the critical mechanism of the formation of textured NdFeB and MnBi permanent magnetic powder and the methods to achieve high coercivity and high maximum energy product. The high-performance magnetic powders with high-temperature stability were obtained. Finally, we explored the synthesized hybrid bonded magnets based on these magnetic powders, which is critical to realizing the mass production of anisotropic bonded magnets.