Microstructure and magnetic properties of backward extruded NdFeB ring magnets by CAPA process

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NdFeB magnets based on the tetragonal $Nd_2Fe_{14}B$ compound have a great variety of applications because of their high energy product, which is sensitive to the degree of alignment of the crystallographic c-axis. Radially aligned nanostructured NdFeB magnets, prepared by backward extruding, are used in voice coil motors and AC servo motor etc [1-2]. It is known that the remanence and coercivity are not homogeneous along the ring axes from the bottom to the top. In this study, the CAPA process [3] was employed in order to fabricate radially oriented NdFeB ring magnets, and their magnetic properties and the degree of alignment were investigated by a pulsed field magnetometer.

Fig. 1 shows the magnetic hysteresis curves as a function of position along the axial direction. The ${}_iH_c$ steadly increases from the bottom (position 5, 57 kA/m) to the top (position 1, 1500 kA/m). Whereas, the position 2 and 3 show the highest B_r of 0.93 T and the alignment degree, B_r/B_s, of 0.7. It is noted that the the position 5 shows soft magnetic properties. It is considered that the bottom region was exposed at high temperature during deformation. The well aligned sub-micrometer grains are observed in the middle parts which show high remanence. The larger grains with size of about 10 ㎛ are observed in the bottom which shows the soft magnetic properties.

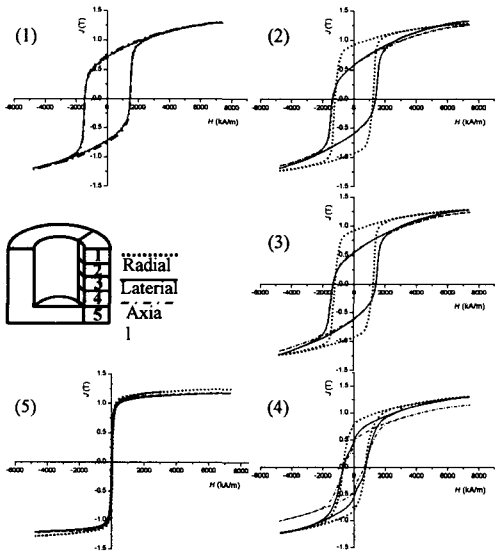

Fig. 1 Magnetic hysteresis curves according to the position of ring magnet.

References

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