Preparation of bulk anisotropic nanocrystalline RCo_5 (R=Sm, Pr) permanent magnets

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Bulk nanocrystalline RCo_5 (R=Sm, Pr) permanent magnets with high coercivity and T_C are promising candidates for practical application at elevated temperature. Recently, strong c-axis crystallographic texture and magnetic anisotropy have been successfully developed in such kind of magnet ($SmCo_5$ for example) by severe hot deformation method. Up to now, however, mechanism of crystallographic texture development in nanocrystalline RCo_5 permanent magnet during hot deformation process is still unknown. In present study, the electron backscattered diffraction (EBSD) has been applied to study the microstructure and crystallographic texture evolution in hot deformed RCo_5 permanent magnets. Increase of height reduction rate of deformed RCo_5 magnets lead to the formation of platelet shape grains perpendicular to the press direction; correspondingly c-axis crystallographic texture were gradually enhanced. As a result, the remanence of the magnets increases substantially. For the first time, it is observed that the grain boundary planes are also textured in the magnet. Therefore, it is expected that the grain boundary (GB) sliding and grain rotation are responsible for the plastic deformation, namely the GB mediated plasticity.

References

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