# TEXTURE DEVELOPMENT IN Nd-Fe-V AND ND-Fe-B ALLOYS BY HOT FORGING IN VIEW OF IMPROVING PERMANENT MAGNET PROPERTIES

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Good levels of coercivity and enhanced magnetic anisotropy are the key for high performance magnets. In the field of Rare-Earth-Transition Metal alloys, the development of anisotropic powders is needed for bonded magnet applications. Anisotropic Nd-Fe-B alloys are already commercially available in small quantities from various but costly processes (HDDR or mechanical deformation of melt-spun ribbons) whereas, only recently some studies report on Nd-Fe-V-N alloys with potential permanent magnet properties. In both cases, improvements in the processes used to develop extrinsic magnetic anisotropy are needed for the engineering of high BHmax magnets.

In this study, a high speed hot forging process was applied to Nd-Fe-B and Nd-Fe-V as cast alloys in order to develop both the microstructure and the crystallographic texture appropriate for permanent magnet properties. Neutron diffraction texture analysis together with magnetic measurements are used to demonstrate the effect of the hot forging process on both kind of alloys. Microstructural changes are an important feature on forging in both cases. Coercivity is developed in the Nd-Fe-B alloy mainly from grain size reduction and disappearance of free iron. Stabilisation of the $Nd(Fe,V)_{12}$ hard magnetic phase is achieved from the iron and Nd-rich microstructure of the starting Nd-Fe-V material.

Concerning magnetic anisotropy, a comparison of the crystallographic texture obtained for Nd-Fe-B and Nd-Fe-V is led. In both cases, a fibre texture is obtained in correlation with the symmetry of the deformation. However, the orientations are quite different in both alloys and the connection with the obtained magnetic anisotropy will be made. Some differences in the deformation mechanisms should explain these peculiar results.