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# Structural and magnetic properties of $\text{NdCo}_{12-x}\text{Fe}_x\text{B}_6$ ferromagnetic compounds

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## ABSTRACT

The effects of Fe substitution on the structural and magnetic properties of  $\text{NdCo}_{12-x}\text{Fe}_x\text{B}_6$  ( $0 \leq x \leq 2.3$ ) series of compounds have been investigated. Fe for Co substitution in  $\text{NdCo}_{12-x}\text{Fe}_x\text{B}_6$  leads to an anisotropic expansion of the unit cell: the initial growth along the *c*-axis is more rapid than that in the basal-plane. All of the compounds are ferromagnets and exhibit a spin reorientation transition. The Curie temperature,  $T_C$ , shows a monotonic decrease with increasing Fe concentration from 155 K to 115 K as *x* increases from 0 to 2.3. A decrease of the spontaneous magnetization,  $M_S$ , is found to occur upon Fe for Co substitution.

Keywords: Intermetallic compounds, Structural properties, Ferromagnets, Spin reorientation transition

## 1. Introduction

Intermetallic compounds based on rare-earth (R) and 3*d* transition metal (T) are not only having several applications in everyday life permanent magnets in motors, sensors, magnetostrictive materials in actuators like SONAR but are also challenging our fundamental understanding of magnetism[1-2]. Indeed they are gathering two different kind of magnetism the itinerant electron magnetism of T elements with the localized magnetism of the 4*f* electronic shells of the R elements. The combination of such different properties is a key point in many applications of binary and ternary R-T materials where the interplay between sublattices have to be optimized in terms of exchange interactions and magnetocrystalline

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