SF-P038

Electronic structure studies of Co-substituted FINEMET alloys by x-ray absorption spectroscopy

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FINEMET type nanocrystalline materials synthesized by controlled crystallization of amorphous ribbons[1] exhibit excellent soft magnetic properties making them attractive for technological applications. Present work reports the electronic structure studies of Co-substituted FINEMET to get information on the effect of successive Co substitution on local environment around Fe and Co atom by using near edge x-ray absorption fine structure (NEXAFS) and x-ray magnetic circular dichroism (XMCD) measurements. NEXAFS spectroscopy and XMCD measurements have been carried out at Fe $L_{3,2}$ and Co $L_{3,2}$-edges to investigate the chemical states and electronic structure of FINEMET $[(Fe_{100-x}Co_x)_{78}Si_9Nb_3Cu_1Ba](0<x<100)$ alloys. NEXAFS spectra at Fe $L_{3,2}$-edge reveal that Fe is in 2+ state and in tetrahedral symmetry with other elements. The magnetic properties exhibiting soft magnetic behavior[2] are discussed on the basis of the electronic structure studied through XMCD.

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