Structural and Mössbauer Studies of (Fe_{0.70}Cu_{0.30})_{90}Cr_{10} Alloys

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Abstract
A specimen of Fe_{63}Cu_{27}Cr_{10} was mechanically alloyed by ball milling for different times the proper amounts of the pure elements. A combination of x-ray diffractometry and Mössbauer spectroscopy has been used to characterize the alloy.

Structural analysis by x-ray diffraction indicates that the mechanical process increases the lattice parameter of both phases (bcc and fcc) as a function of milling time. The bcc-Fe phase subsequently diminishes, due to the progressive incorporation of the iron and chromium atoms into the fcc copper matrix. Measurements of the width at half-maximum of the peak have confirmed that the average crystallite size decreases with increasing milling time. Room temperature Mössbauer spectra of the alloy system ball-milled for different milling times show that iron is present in more than one magnetic phase. Mössbauer spectra of all samples have generally a broad magnetic component corresponding to the fcc Fe-Cu-Cr extended solid solution. The analysis of the Mössbauer spectra indicates the presence of a small amount of γ-Fe initially, which increases with milling times.