

Structural and magnetic studies of sputtered $\text{Fe}_{1-x}\text{Cr}_x$ thin films

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Abstract: X-ray diffraction, magnetization, and Mössbauer effect investigations have been performed for sputtered $\text{Fe}_{1-x}\text{Cr}_x$ ($0 \leq x \leq 0.54$) thin films. The body-centered-cubic (bcc) phase appears for $x < 0.32$, while the σ phase is formed for $0.38 \leq x \leq 0.44$. For $0.32 \leq x < 0.38$ and $0.44 < x \leq 0.54$, the samples are composed of both bcc and σ phases. As the Cr concentration increases, the ferromagnetic fraction, magnetization, and magnitude of the hyperfine field decrease, whereas the magnitude of the isomer shift increases. The Fe and Cr magnetic moments, isomer shift, and hyperfine field of the bcc Fe-Cr phase have been deduced and are discussed consistently in terms of charge and spin distributions, as well as magnetic valence. © 2000 American Institute of Physics.

Year: 2000

Source title: Journal of Applied Physics

Volume: 88

Issue: 8

Page : 4778-4782

Cited by: 5

Link: Scopus Link

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ISSN: 218979

CODEN: JAPIA

Language of Original Document: English

Abbreviated Source Title: Journal of Applied Physics

Document Type: Article

Source: Scopus

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