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Thin Film X-Ray Diffraction Method

2.2 Diffraction X-Ray Intensity and Penetration Depth

Diffraction X-ray intensities (I_r) obtained in the TFXD method are calculated by Eq. (1) by giving the linear absorption coefficient of the substance, film thickness, incident angle, and reflection angle.[5,6]

where I_0: Diffraction X-ray intensity per unit volume without absorption

S: Sectional area of incident X-ray beam flux

α: Angle formed between specimen and incident X-ray beam

β: Angle formed between specimen and X-ray detector

μ: Linear absorption coefficient of specimen

t: Thickness of specimen

Figure 2 shows the dependence of incident angle on the diffraction X-ray intensity for a 100-nm thick speci-

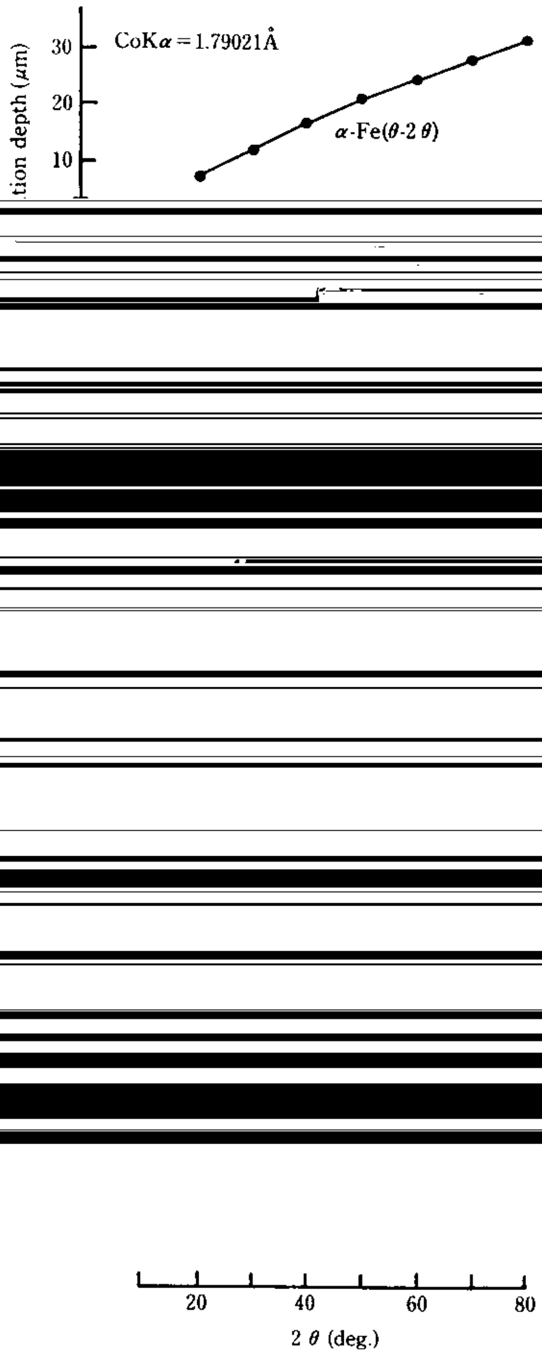
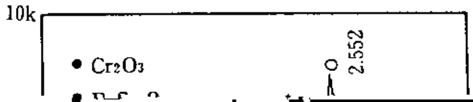


Fig. 3 Effective penetration depth changes with incident angles by the θ-2θ diffraction method and TFXD (α = 2.5)

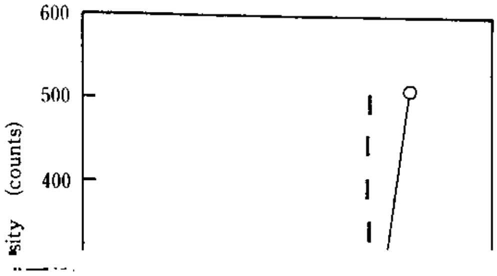
where R_x: Diffraction X-ray intensity ratio obtained from a sufficiently thick specimen and a thin film ing optical system are adopted. A specimen spinner is

The measurement conditions A, B and C are those in

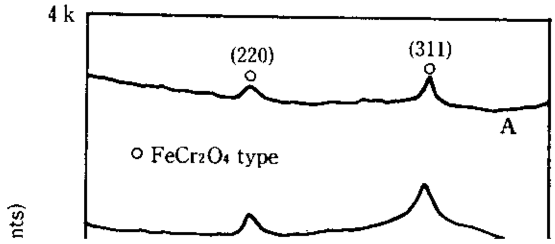


4.2 Oxide Layers on Bright-Annealed AISI 304 Stainless Steel Sheet

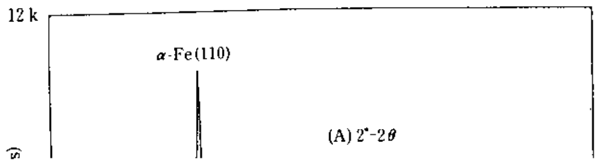
Some of AISI 304 stainless steel sheets are bright-



600
500
400
sity (counts)



4 k
(220)
(311)
A
○ FeCr2O4 type
nts)



(2) Thin Si films deposited on glass plates beyond the detecting capacity of the θ-2θ method were easily recognized.

(3) α-Fe of thin films below 10 nm vacuum-deposited on glass plates was recognized.