

Pretransition Phenomena(Metallurgy)

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journal or publication title	Science reports of the Research Institutes, Tohoku University. Ser. A, Physics, chemistry and metallurgy
volume	27
page range	84-84
year	1979
URL	http://hdl.handle.net/10097/28044

Metallurgy

Pretransition Phenomena

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J. Phys. (Paris), Colloq. (1977), C7, 430.

Four types of fluctuations — 1) classical, 2) antiphase, 3) heterophase and 4) critical — are described and used to review several broad aspects of pretransition phenomena that have been reported near second- and first-order transitions in both real and model systems. Direct observations of pretransition phenomena in the electron microscope have revealed critical fluctuations in an Fe-26.5 at/o Al alloy and heterophase fluctuations in a CuAu alloy. The latter appear to be interacting strongly with dislocations and the free surface of the foil. Evidence for heterophase fluctuations in Cu₃Au has also recently been reported based on the temperature dependence of the short range order intensity near the transformation temperature. Experiments on the central peaks observed at structural phase transitions suggest that they have a dual intrinsic-extrinsic origin resulting from a mix of dynamical cluster waves and static clusters formed at impurities and defects. Computer experiments on model systems are reviewed as they give an insight into phase transitions and allow an exacting test of theoretical formulations without the many complicating effects found in real systems.

The X-Ray Photo-Electron Spectra of Several Oxides of Iron and Chromium

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Corros. Sci., 17 (1977), 559.

X-ray photo-electron spectra of Fe₂O₃, Fe₃O₄, α-FeOOH, γ-FeOOH, Cr₂O₃, Cr(OH)₃·0.4H₂O and CrO₃ were measured. The peak binding energies of 2*p*, 3*s* and 3*p* electrons of Fe and Cr in the above substances were determined. The largest valency dependence was observed in 2*p* electrons. Binding energies of O 1*s* electrons were also measured for those oxides and hydroxides. For quantitative analysis the ratios of photo-electron cross-sections of Fe 2*p*_{3/2} and Cr 2*p*_{3/2} to O 1*s* electron levels were estimated as 1.45 and 1.71, respectively, for excitation by Al Kα_{1,2} radiation.

XPS Determination of Compositions of Alloy Surfaces and Surface Oxides on Mechanically Polished Iron-Chromium Alloys

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Corros. Sci., 17 (1977), 713.

Using the XPS technique, the compositions of the alloy surface and the surface oxide on mechanically polished iron-chromium alloys were studied. For quantitative analysis, the ratio of photo-ionization cross section of Fe 2*p*_{3/2} electrons to that of Cr 2*p*_{3/2} electrons was estimated as 1.35 for Al Kα_{1,2} radiation. Assuming a