Kondo Effect in the Transport Properties of the CsCl-Type Compounds Fe_<1-x>Ti_<1+x> : II. Magnetic Scattering Center due to Atomic Disordering(Physics)

著者	IKEDA K., NAKAMICHI T., YAMADA Y., YAMAMOTO M.
journal or publication title	Science reports of the Research Institutes, Tohoku University. Ser. A, Physics, chemistry and metallurgy
volume	26
page range	170-171
year	1976
URL	http://hdl.handle.net/10097/27809

Origin of Superparamagnetism in the CsCl-Type Compounds, $Fe_{1-x}Ti_{1+x}$, near the Stoichiometric Composition

Kôki IKEDA, Takurô NAKAMICHI and Mikio YAMAMOTO

J. Phys. Soc. Japan, **37** (1974), 652.

A superparamagnetic behavior at low temperatures is observed in the magnetization and the specific heat of the CsCl-type compounds, $Fe_{1-x}Ti_{1+x}$, near the stoichiometric composition. The concentration and the magnitude of magnetic moment of the superparamagnetic cluster are estimated from the experimental results as 1.0×10^{-3} per atom and $12\,\mu_B$ per cluster, respectively. This behavior, however, becomes abruptly weak in the titanium-rich compositions beyond 51 at% Ti, where the anomalous transport phenomena similar to the Kondo effect are observed. This characteristic composition dependence suggests that the superparamagnetism in $Fe_{1-x}Ti_{1+x}$ with $x\approx0$ is due to the magnetic iron cluster, that is expected from the trace of Laves phase or the antiphase boundary of CsCl-type structure produced by a peritectic formation in these compounds near the stoichiometric composition.

Kondo Effect in the Transport Properties of the CsCl-Type Compounds $Fe_{1-x}Ti_{1+x}$. I. Their Anomalous Behaviors in the Titanium-Rich Compositions

K. IKEDA

Phys. Stat. Sol. (b), **62** (1974), 655.

A resistance minimum at 30 to 60°K and a negative and giant valley of the thermoelectric power near 47°K were observed in the CsCl-type compounds, $Fe_{1-x}Ti_{1+x}$, with titanium-rich compositions. This anomalous behavior of the transport phenomena, which are distinct from those of the stoichiometric compound showing an ordinary temperature dependence of the resistivity and a positive and monotonically increasing thermoelectric power, have features similar to the Kondo effect in dilute magnetic alloys. It is suggested that such anomalous phenomena may be caused by the existence of the iron atoms occupying the wrong atomic sites in a slightly disordered CsCl-type lattice.

Kondo Effect in the Transport Properties of the CsCl-Type Compounds $Fe_{1-x}Ti_{1+x}$. II. Magnetic Scattering Center due to Atomic Disordering

K. IKEDA, T. NAKAMICHI, Y. YAMADA and M. YAMAMOTO

Phys. Stat. Sol. (b), **63** (1974), 361.

Neutron diffraction measurements were made at room temperature for the CsCl-type compounds, $Fe_{1-x}Ti_{1+x}$, in order to confirm the origins of the anomalous transport phenomena in the titanium-rich compositions and the superparamagnetism near the stoichiometric one. On the basis of those results, it could be concluded that the former behaviour is due to the Kondo effect, originating in a magnetic cluster of nine iron atoms with a concentration of about 10^{-2}, produced by the

atomic disorder. The composition dependence of the residual resistivity also seems to be explainable from this point of view.

Slip Patterns of Copper Whiskers Subjected to Tensile Deformation

Y. GOTOH

Phys. Stat. Sol. (a), **24** (1974), 305.

Slip patterns of copper whiskers with [001], [011], and [111] orientations subjected to tensile deformation have been observed with a differential interference-contrast microscope. In some whiskers, a slip line appears below or just below the yield stress and its step height increases with increasing strain. The yield drop occurs when the slip line is crossed by another slip line newly formed and the Lüders band propagates from this crossing place. At the front of the Lüders band, slip lines due to cross slips or double cross slips are observed. This fact means that the Lüders band propagates by cross slip or double cross slip mechanisms.

An X-Ray Diffraction Study of Atomic Ordering in Platinum-Rich Copper-Platinum Alloys

Nan-Chung WU, Hiroshi IWASAKI and Shiro OGAWA.

Trans. Japan Inst. Metals, **14** (1973), 309.

Atomic ordering in the copper-platinum alloy system has been studied by X-ray diffraction using single crystals with compositions of Cu–48, 54, 61, 66 and 70 at% Pt. At the composition near the equiatomic one, an ordered structure CuPt, first found by Johansson and Linde, has been confirmed. A negative result has been obtained for the existence of an ordered structure Cu_3Pt_5, which was proposed by Linde. An ordered structure formed at the composition near $CuPt_3$ has been shown to be consistent with the structure model of Tang rather than that of Schneider and Esch.

Atomic Ordering and Lattice Distortion in the Zirconium-Oxygen Alloys with 28.2 and 29.2 at.% Oxygen

Shinya HASHIMOTO, Hiroshi IWASAKI, Shiro OGAWA, Sadae YAMAGUCHI and Makoto HIRABAYASHI

J. Appl. Crystallography, **7** (1974), 67.

The structure of the interstitially ordered lattice formed in zirconium-oxygen alloys has been studied with use of single-crystal data obtained by X-ray and neutron diffraction methods. The structure belongs to space group $P312$ and the lattice parameters a and c are related to a_0 and c_0 of the host hexagonal metal lattice by $a=\sqrt{3}a_0$ and $c=c_0$. The ordered arrangement of interstitial oxygen atoms is described as a regular stacking of layers parallel to the (00.1) plane with the sequence $(AC)B(AC)B\ldots$, which is of the same type as that of nitrogen atoms in ε-Fe_2N. The occupancy probability of oxygen atoms is high for interstitial sites of the A and B types while it is low for sites of the C type. The host metal lattice