The Contact Charge Densities of 4s Electrons of Fe Impurity Atom in Some Transition and Noble Metals(Physics)

The Contact Charge Densities of 4s Electrons of Fe Impurity Atom in Some Transition and Noble Metals

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The internal conversion electrons from M and N shells of the 14.4 keV transition of ^{57}Fe diffused into Cr, Ni, Cu, Pt and Au substrates were measured using a high-resolution β-ray spectrometer.

From relative intensities of conversion electrons analyzed using a deconvolution method, we deduced the contact charge density of 4s electrons $\rho_{4s}(0)$ of ^{57}Fe impurity atom in these host metals. The 4s contact charge density of ^{57}Fe embedded in these host metals, as well as Fe and Co metals, is found to be nearly equal. This fact indicates that the 3s contact charge density $\rho_{3s}(0)$ plays an important role in the variation of the isomer shift of ^{57}Fe in these alloys.

Helical Spin Structure of Mn_3Si

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The magnetic structure of Mn_3Si (bcc Fe_3Al type crystal structure) at low temperatures has been determined by neutron diffraction using single crystal samples. It is found that Mn_3Si has a helical spin structure (Néel temperature 25.8 K) with a wave vector q parallel to one of $\langle 111 \rangle$ directions and of magnitude $0.85 \cdot 1/2 \cdot 2\pi K_{111}$, which is near the boundary of the Brillouin zone. The magnetic structure is either a proper screw or a transversal sinusoidal structure and the magnetic moments at the two Mn sites are $\mu_{Mn_I}=1.72\,\mu_B$ and $_{Mn_{II}}=0.19\,\mu_B$. The temperature dependence of the magnitude of the wave vector q is similar to that of Cr. From these data the possibility of an itinerant electron antiferromagnetism of Mn_3Si is suggested in comparison with the SDW in Cr.

Neutron Diffraction Study of Cr_2Te_3 Single Crystal

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Neutron diffraction measurements of Cr_2Te_3 single crystal have been made. The magnetic moments in the fully occupied layers have been determined, which are ferromagnetically aligned and point along the c-axis with an average moment value of 2.65 μ_B. The moments in the partially occupied layers give a small antiferromagnetic contribution. These values are smaller than the spin only value of the Cr^{3+} ion.