H.Kato, Faculty of Engineering, Tohoku University, Aramaki, Sendai 980-77, Japan.
H.Onodera, **Y.Yamagochi**, Institute of Materials Research, Tohoku University, Sendai 980, Japan.
K.Kanematsu, The Physical Science Labolatories, Nihon University at Narashino, Funabashi, Chiba 274, Japan.

A high temperature phase of $(Ni_{1-x}Mn_x)_{1.9}Ge$ is found to be a hexagonal Ni_2In type structure in the range of $0 \leq x \leq 0.7$. A phase transition of Ni_2In type <=> TiNiSi type occurs in the alloys of $0.45 \leq x \leq 0.55$ below 270K. $Ni_{1.9}Ge$ is paramagnetic and a magnetic correlation is induced with substitution of Mn for Ni. In the alloys of $0 \leq x < 0.35$, the temperature dependence of ac susceptibility (χ_{ac}-T curve) shows a cusp first and then a hump with substitution of Mn for Ni. The cusp and hump suggest a change from a spin glass state and a cluster spin glass state with the substitution. The alloys with $0.35 \leq x < 0.45$ are ferromagnetism. The σ-T curve on cooling shows ferromagnetism at T_C and then a magnetic cooling effect below the freezing temperature T_f, suggesting a re-entrant spin glass state. The glass like behavior shows an existence of antiferromagnetic interactions between the nearest neighbors in the hexagonal lattice. $(NiMn)_{1.9}Ge$ (x=0.5) exhibits the Ni_2In type <=>TiNiSi type phase transition at T_D=267K on cooling, while the stoichiometric NiMnGe shows the phase transition at T=470K. The Ni_2In type structure is stabilized with the deficiency of transition metal atoms. The TiNiSi type phase is an antiferromagnet, perhaps of a spiral magnetic structure as same as NiMnGe. The alloys of x=0.45 and 0.55 show paramagnetism, ferromagnetism and antiferromagnetism on cooling and this process is reversible. The ferromagnetism <=> antiferromagnetism transition occurs with the Ni_2In <=> TiNiSi phase transition. The alloys of $0.55 \leq x \leq 0.7$ are the Ni_2In type structure and show ferromagnetism. The Curie temperature decreases from T_C=204K of x= 0.55 to 148K of x=0.7.

Q2-60 METAMAGNETISM IN Fe-Mn-Al ALLOYS

H. Bremers, **J. Hesse**, Institut für Metallphysik und Nukleare Festkörperphysik, D-38106 Braunschweig, Germany
H. Ahlers and J. Sievert, Physikalisch-Technische Bundesanstalt, D-38106 Braunschweig, Germany

In ternary alloys consisting of two 3d transition elements (i.e. Fe, Mn) and aluminium (Al) admixtures of the last element cause drastic changes in the magnetic moments of the constituents and therefore on the alloy magnetic properties. In this contribution we report results of experiments performed on a series of $Fe_{60-x}Mn_{40}Al_x$ alloys by magnetisation measurements and Mössbauer spectroscopy. Increasing step by step the aluminium concentration the alloys change their behaviour from ferromagnetic to antiferromagnetic crossing regions with re-entrant spin glass behaviour. In regions of aluminium concentrations above 25 at% we observe the onset of antiferromagnetism at temperatures around 20 K. Application of magnetic fields leads to typical metamagnetic behaviour. Increasing the magnetic field causes the cusp (characteristic for antiferromagnetism) disappearing and the magnetisation value at low temperatures increasing. An important experimental fact is that these alloys exhibit some tendencies to order. Because of the coexistence of a disordered and ordered phase the interesting experimental question is which phase is causing the metamagnetic behaviour. Additionally Mössbauer spectroscopy is applied without external magnetic fields. Observing the spectra below the onset of antiferromagnetism versus temperature unexpected courses in the isomer shift and the spectrum area appear. Both quantities indicate changes in the electronic structure of these alloys due to the magnetic phase transition.

Q2-61 MAGNETIC HYPERFINE FIELD AT Hf SITE IN $Hf(Fe_{1-x}Co_x)_2$ AND $Hf(Fe_{1-x}Co_x)_2H_y$ AT LOW Co CONCENTRATION

A.W.Carbonari, **J.Mestnik Filho**, **R.N.Saxena**, Instituto de Pesquisas Energéticas e Nucleares, IPEN-CNEN/SP, São Paulo, Brasil.

The stoichiometric AB_2 cubic Laves compounds are well suitaded for the study of the magnetic hyperfine field behaviour because of their cubic simmetry and well defined position of the atoms in the lattice. The pseudobinary compound $Hf(Fe_{1-x}Co_x)_2$ crystallizes in the cubic Laves phase showing a spontaneous magnetization which decreases with x and presents a transition from ferromagnetism to paramagnetism at x = 0.65, with a sharp collapse of the magnetic moment[1].
At low Co concentration, different Hf nearest neigbhour configurations can simultaneously be present in several sublattices varying from undisturbed neighbourhood (only Fe atoms) to configurations where one or more Co replace Fe atoms. The measurement of the magnetic hyperfine field at the Hf site in these situations is therefore an ideal way to investigate microscopically the collapse of the ferromagnetic order.
In the present work, the magnetic hyperfine field has been investigated at Hf site in pseudobinary $Hf(Fe_{1-x}Co_x)_2$ and $Hf(Fe_{1-x}Co_x)_2H_y$ $(0.1 \leq y < 1)$ alloys in the range of $0 \leq x \leq 0.6$ by TDPAC measurements. The results shows that for $0.01 \leq x \leq 0.10$ there are three different values of mhf, corresponding to undisturbed neighbourhood of the Hf, and the Hf neighbourhood configurations where one and two or more Co atoms replace some of the 12 nearest neighbour Fe atoms respectively. The value of the mhf at Hf site for undisturbed neighbourhood decreases linearly with the Co concentration, which indicates that a longer range rather than just the nearest neighbour interaction is important in the formation of the magnetic order. The results for hydrogenated alloys show a similar behaviour except that the presence of long range interactions is not indicated.

[1]T. Sakakibara, T. Goto, Y. Nihihara, J. de Phys. 12(1988)C8-263

Q2-62 COMPARISON OF THE MÖSSBAUER SPECTRA OF BULK $Fe_{0.54}Ni_{0.46}$ TO THOSE OF ULTRAFINE $Fe_{0.50}Ni_{0.50}$

J. Chadwick, Department of Physics, Monash University, Clayton, Victoria 3168, Australia.
Yu. V. Baldokhin, Yu. I. Petrov and E.A. Shafranovsky, Institute of Chemical Physics, Russian Academy of Sciences, Kosygin Ulitsa 4, 117977, GSP-1, Moscow V-334, Russia.

Mössbauer spectra of bulk $Fe_{0.54}Ni_{0.46}$ and 10 nm $Fe_{0.50}Ni_{0.50}$ were collected in zero external magnetic field at temperatures between 2.6 K and room temperature, and at 6 K in longitudinal external magnetic fields between 1.3 T and 14.3 T. The two sets of spectra were compared in order to determine the surface attributes of ultrafine iron-nickel grains. The spectra of 10 nm $Fe_{0.50}Ni_{0.50}$ have been interpreted with reference to the characteristics ascribed to nanocrystalline matter.

Q2-63 TRANSVERSE SPIN FREEZING IN ANTIFERROMAGNETIC γ- $Mn_{90}Cu_{10}$

L D Cussen, Department of Applied Physics, Victoria University of Technology, Footscray 3011, Australia
M F Ling, **T J Hicks**, Department of Physics, Monash University, Clayton 3168, Australia
R Piltz, Australian Nuclear Science and Technology Organisation, Private Mailbag, Menai 2234, Australia
Y Tsunoda, Department of Applied Physics, School of Science and Engineering, Waseda University, 3-4-1, Okubo, Shinjuku, Tokyo 169, Japan

γ-$Mn_{90}Cu_{10}$ is face centred tetgraonal with c/a<1 and antiferromagnetic with the antiferromagnetic direction along the c-direction. A single domain can be preferred in a single crystal by applying pressure along the c-direction. A crystal prepared in this way was checked by neutron diffraction and found to be more than 98% one domain. Low field (100 Oe) field cooled (FC) and zero-field cooled (ZFC) magnetic susceptibility meaurements clearly show spin freezing at 50K, well below the Néel temperature of about 425K. Measurements taken parallel to the antiferromagnetic direction show much less difference between the ZFC and FC susceptibilities than those taken perpendicular to the antiferromagnetic direction along <110>. Preliminary neutron measurements of the temperature dependence of the intensity of the (110) magnetic Bragg peak show no anomaly at the freezing temperature.

Q2-64 THE TEMPERATURE DEPENDENCE OF THE MAGNETIC EXCITATIONS IN NEARLY ANTIFERROMAGNETIC $Cr_{0.95}V_{0.05}$

R Doubble, **S M Hayden**, H.H. Wills Physics Laboratory, University of Bristol, Bristol BS8, UK
G Aeppli, NEC Research Institute, 4 Independence Way, Princeton, NJ 08540, USA
T Perring, ISIS Facility, Rutherford Appleton Laboratory, Oxon OX11 0QX, UK
J Kulda, **A Bouvet**, Institute Laue Langevin, Grenoble, France
E Fawcett, Department of Physics, University of Toronto, Canada M5S 1A7

$Cr_{0.95}V_{0.05}$ is close to antiferromagnetic order at low temperatures. We present neutron scattering measurements of the magnetic excitations in this material using triple-axis and pulsed-spallation-neutron scattering techniques. Measurements are made in the energy and temperature ranges 2-400 meV and 2-1000 K, respectively. In agreement with previous measurements, we observe six incommensurate peaks in c"(Q,w) at low frequency and temperature. These have been previously attributed to Fermi surface nesting. At all temperatures, the low-frequency wavevector-integrated susceptibility c"(w) is proportional to w. On warming, the incommensurate peaks merge into a single commensurate peak and the gradient of c"(w) is substantially reduced. Increasing frequency also results in a broadening of the peaks in c"(Q,w). Comparisons are made with measurements on the high-T_c superconductor $La_{1.86}Sr_{0.14}CuO_4$ where quantitatively similar observations have been made.

Q2-65 ATOMIC-VOLUME DEPENDENCE OF SPIN STATE IN Fe-RICH FCC Fe-Pt-Ru ALLOYS

T Goto, **X Ono**/ **T Kanomata**, **K Watanabe**, Faculty of Engineering, Tohoku Gakuin University, Tagajo 985, Japan