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ABSTRACTS

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$M/H-T$ curve and the M/H takes almost constant value below the bending temperature. Since this bending temperature corresponds to the Néel temperature determined from the heat capacity measurements, we identify the temperature independent susceptibility as the perpendicular susceptibility of an anisotropic antiferromagnet. We also observed a change in the $M-H$ curves of NDMAP. The magnetic field when M changes corresponds to the phase boundary between the field induced LRO and paramagnetic phases determined from the heat capacity measurements.

* Z. Honda, H. Asakawa and K. Katsumata, Phys. Rev. Lett. **81**, 2566 (1998)

FQ-05. Magnetism of Fe-Al Disordered Alloys: An Ising-Monte Carlo Approach. *J. Restrepo* (Universidad de Antioquia, Departamento de Fisica, A. A. 1226, Medellin, Antioquia, CO), G. A. Perez Alcazar (Universidad del Valle, Departamento de Fisica, A. A. 25360, Cali, Valle, CO), and D. P. Landau (The Univ. of Georgia, Ctr. for Simulational Phys., Athens, Georgia, 30602-2451, US)

Based on a model of atoms randomly distributed on a cubic lattice, the atomic disorder induced in quenched binary alloys has been simulated. The study has been developed within the framework of a random site-diluted Ising model with nearest-neighbor interactions and by using a Monte Carlo algorithm implemented with Metropolis kinetics for sampling states. After equilibration, ensemble and configurational averages for magnetization, magnetic susceptibility and heat capacity were computed. It is concluded that, in agreement with previous experimental Mssbauer data for which a comparison is carried out, the Fe-Al disordered alloys exhibit room temperature ferromagnetic behavior up to around 42 at.% Al beyond which the system becomes paramagnetic. This result contrasts with that for alloys with atomic order that exhibit ferromagnetism only up to 30 at.% Al. Finally, a finite size scaling analysis for the simulated system was also performed.

FQ-06. Magnetic properties of $Nd_{1/3}Sr_{2/3}FeO_3$ by neutron diffraction and Mössbauer studies. *Young Rang Uhm* and Chul Sung Kim (Kookmin Univ., Dept. of Phys., Sungbukgu, Seoul, 136-702, KR)

Charge transfer type $Nd_{1/3}Sr_{2/3}FeO_3$ was synthesized, and its magnetic properties were investigated by neutron diffraction and Mössbauer spectroscopy at various temperatures ranging from 4.2 K to room temperature. The lattice constant with rhombohedral represents $a_0 = 5.457$ Å, and $\alpha = 60.122$ °. The Magnetic hyperfine fields at 4.2 K show 469 kOe for Fe^{3+} and 243 kOe for Fe^{5+}. The spin rotation resulting from helical spin of Nd was observed at and below 25 K. The electric quadrupole splitting which is for Fe^{3+} and Fe^{5+} is 0.07 and 0.15 (mm/s) at 4.2 K, which values were changed -0.06 and -0.02 (mm/s) at and above 20 K. It is an important evidence of spin rotation exists in $Nd_{1/3}Sr_{2/3}FeO_3$ from 4.2 to 20 K. The powder neutron diffraction exhibits magnetic ordering structures. The $Nd_{1/3}Sr_{2/3}FeO_3$ with least lattice distortion underwent a charge ordering(CO) phase-transition at and below $T_{CO} = 163$ K corresponding sequence of $Fe^{+3}Fe^{+3}Fe^{+5}Fe^{+3}Fe^{+3}Fe^{+5}$ exists aligned along the z-direction of rhombohedral as well as canted antiferromagnetic spin ordering.

FQ-07. Crystallographic and magnetic properties of Iron Sulfides Doped with 3d Transition-Metal. *Eng-Chan Kim* (Yeungnam Univ., Dept. of Phys., Dae-dong 214-1, Gyongsan, Kyungbook, 712-749, KR)

Iron sulfide FeS exhibits interesting magnetic and crystallographic phase transition. In the neighborhood of $T_\alpha \approx 400K$, a crystallographic phase transition appears, usually called the α transition. FeS exists with a hexagonal $NiAs$ structure above T_α and transform below T_α to a hexagonal superstructure having a unit cell six times as neutron-diffraction measurements show that of the $NiAs$ structure above T_α. Magnetic-susceptibility and temperature of about $600K$ and that the spin direction changes from perpendicular to parallel with the c axis below this temperature, the spin-rotation temperature T_M (Morin transition temperature). It is found by Mossbauer measurements on $M_{0.025}Fe_{0.975}$ (M=Sc, Ti, V, Cr, Mn, Co, Ni, Cu) that the 3d-transition metal impurities profoundly affect both the crystallographic, and spin rotation transitions of iron sulfide in this research. It is evident that there is no definite relationship between the lattice parameters and the number of 3d electrons. However, it is noteworthy that $V_{0.025}Fe_{0.975}S$ and $Co_{0.025}Fe_{0.975}S$ have lattice parameters which are distinctly different from those of FeS ; furthermore, the directions of change of the lattice parameters are opposite for $V_{0.025}Fe_{0.975}S$ and $Co_{0.025}Fe_{0.975}S$. a_0 of $V_{0.025}Fe_{0.975}S$ is much less than that of FeS while a_0 of $Co_{0.025}Fe_{0.975}S$ is much larger than that of FeS. On the other hand, c_0 of $V_{0.025}Fe_{0.975}S$ is larger than that of FeS whereas c_0 of $Co_{0.025}Fe_{0.975}S$ is less than that of FeS. It is noteworthy that both $V_{0.025}Fe_{0.975}S$ and $Co_{0.025}Fe_{0.975}S$ have Morin transition temperatures T_M which are distinctly different from that of FeS ; furthermore, the rections of changes of T_M are opposite for $V_{0.025}Fe_{0.975}S$ and $Co_{0.025}Fe_{0.975}S$. A vanadium impurity of 2.5% of the metal atoms if the iron sulfide makes the crystallographic transition in FeS take place rapidly in a narrow temperature region of about $15K$, while the α transition in FeS takes place over a wide temperature range of about $200K$. It is also found that the α transition for $V_{0.025}Fe_{0.975}S$ has a hysteresis width of $5K$.

FQ-08. The magnetic phase transition in Fe_2Ho single crystal. R. A. Silva, *A. A. Coelho*, C. S. Alves, and S. Gama (Universidade Estadual de Campinas - IFGW, DFA - GPCM, C.P. 6165, Campinas, SP, 13083-910, BR)

In order to investigate the magnetic phase transition in Fe_2Ho single crystal, we have prepared high quality single crystal of Fe_2Ho alloy using the conventional Czochralski technique. A 1.2 mm diameter sphere was cut by spark-erosion. The magnetic behaviour of Fe_2Ho single crystal is investigated by measuring the magnetic moment in the critical regime and in the paramagnetic regime for applied fields from 10 mT to 4 T. The Fe_2Ho phase shows a ferromagnetic phase transition, and the critical exponents of this transformation β, γ', γ and δ are determined by modified Arrot plots, scaling plots, ln J vs. ln(μ_0 H) plots and the method of Kouvel and Fisher. Well-defined phase transition is found to exist in this sistem with the values of the asymptotic critical exponents and the universal amplitude ratios very to those predicted by the renormalization group calculations for a three-dimentional isotropic short-range Heisenberg ferromagnet.

FQ-09. Metallization of magnetite (Fe3O4) under high pressure. *Sakae Todo*, Nao Takeshita, Takahiro Kanehara, Tamiko Mori, and Nobuo Mori (Univ. of Tokyo, Inst. for Solid State Phys., 5-1-5 Kashiwanoha, Kashiwa, Chiba, 277-8581, JP)

Electrical resistivity measurements have been made on a good qualified single crystalline magnetite(Fe3O4) at temperatures from 300 K down to 3.0 K under high pressure up to 10 GPa. A steep change in resistivity at the Verwey transition temperature has been observed even at pressures over 3.5 GPa, which shows a quite distinct result reported in prior work(1). Moreover, the Verwey transition temperature has been found to decrease non-linearly with increasing pressure and surprisingly it disappears at around 8 GPa. Above 8 GPa magn etite exhibits metallic behavior. The residual resistivity ratio(RRR) of the matallic state is observed to be more than 300. This is the first finding of a metallic magnetite.

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FQ-10. Metal-insulator transition in Gd_5Ge_4. *E.M. Levin*, V.K. Pecharsky, and K.A. Gschneidner, Jr. (Iowa State Univ., Ames Lab., Dept. of Mater. Sci., Ames, IA, 50011-3020, US)

Temperature (4.3-300 K) and magnetic field (0-100 kOe) dependencies of the electrical resistance and heat capacity of Gd_5Ge_4 are quite different when compared with those in other Gd-based intermetallic compounds. The resistivity of Gd_5Ge_4 in general is similar to [1] and has metallic-like

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