the guest intercalate. Mechanisms for these novel processes and optical changes will be presented.

[1] A.M. Ghoraybe, C.C. Coleman and A.D. Yoffe J. Phys. C. (U.S.) 17, L715 (1984).

SESSION FN: SUPERCONDUCTIVITY—GENERAL

Tuesday morning, 17 March 1987
Nassau A Room at 11:00
M. Tinkham, presiding

11:00

FN 1 Magnetic Phase Transition Under Pressure in the Reentrant Superconductor $Tm_2Fe_3Si_5$. J.A. GOTAAS, NBS, Gaithersburg, MD 20899, J.W. LYNN, Physics, U. Maryland, College Park, MD 20742, and NBS; R.N. SHELTON, Iowa State U.† -- At ambient pressure $Tm_2Fe_3Si_5$ is an ordinary antiferromagnet with T_N = 1.1 K;[1] under applied pressures of 2 to 21 kbar there is a superconducting phase transition at $T_{c1} > T_N$, followed by reentrance to the normal state at $T_{c2} \approx T_N$ as measured by ac susceptibility. The presence of thermal hysteresis in T_{c2} suggests some first-order character to the transition.[2] We report neutron diffraction measurements on this system at pressures up to 8 kbar and temperatures down to 0.3 K, which show that the antiferromagnetic structure remains unchanged under the application of pressure. We find no evidence for the existence of a ferromagnetic component which could suppress the superconductivity and no measurable thermal hysteresis in the antiferromagnetic peak intensity under pressure.

*Supported by the NSF, DMR 83-19936.
†Sponsored by DOE Grant No. WPAS-KC-02-02-02.
[1] A.R. Moodenbaugh, D.E. Cox and C.B. Vining, Phys. Rev. B32, 3103 (1985).
[2] C.B. Vining and R.N. Shelton, Solid State Commun. 54, 53 (1985).

11:12

FN 2 Magnetization and Heat Capacity of a Single Crystal of $ErRh_4B_4$. D. DUMMER, P. ANDERSEN, W. WEYHMANN, D. DAHLBERG, U. of Minnesota; D. HINKS, Argonne Nat. Lab.--We have made simultaneous measurements of the heat capacity and magnetization in a single crystal of $ErRh_4B_4$. The experiments have focused on the temperature region where the sample transforms from the ferromagnetic state to the superconducting or coexistence state. The measurements were made in applied magnetic fields from 1 to 3 Oe. In the presence of these small applied fields superheating effects were observed in the heat capacity as was previously observed in zero applied magnetic field. The magnetic response of the system when a superheating transition occurs will be discussed.

Supported in part by the US DOE

11:24

FN 3 Ultrasonic Relaxation Attenuation of $Er_{1-x}Ho_xRh_4B_4$. K. J. SUN,* R. SORBELLO, M. LEVY,* University of Wisconsin; M. B. MAPLE,† M. S. TORIKACHVILI,† Institute for Pure and Applied Physical Sciences, University of California-San Diego.--Ultrasonic attenuation measurements have been performed on the samples with x=0, 0.295, 0.6, 0.813, 0.912 and 1 of $Er_{1-x}Ho_xRh_4B_4$ system. A bell-shaped maximum observed on each of the temperature dependent attenuation curves shifted its position to higher temperature when x was increased. This maximum which was also wave frequency dependent as shown in the experimental results of the samples with x=0.813 and 1 is believed to be a relaxation type attenuation maximum that is associated with the split ground state of magnetic ions. An expression which relates the attenuation to the oscillation of the energy levels of magnetic ions due to the propagation of an ultrasonic wave through the sample is derived. By taking the experimental attenuation results and low temperature specific heat data, the temperature dependent relaxation time may be obtained through this equation.
*Research supported by Air Force Office of Scientific Research under AFOSR Grant No. 84-0350
† Research supported by Department of Energy under Grant No. DE-FG03-86 ER 45230.

11:36

FN 4 Specific Heat of BaLaCuO Superconductors. R. L. GREENE, A. M. TORRESSEN, S. VON MOLNAR, IBM, Thomas J. Watson Research Center, Yorktown Heights, NY 10598, J. G. BEDNORZ, K.A. MÜLLER, IBM Research, Ruschlikon, Switzerland.-- We report specific heat measurements on the new high T_c superconductors of the composition $La_{2-x}Ba_xCuO_{4-y}$ with $x<<1$ and $y>0$. Polycrystalline samples with x=.15 show a resistivity drop of three orders of magnitude and a transition from Pauli paramagnetism to diamagnetism with an onset temperature between 30 – 35K.[1,2] The transition is complete by 10K and magnetic field studies suggest superconductivity of a percolative or granular nature. Our specific heat experiments indicate a large electron density of states but no evidence of a sharp jump near T_c - consistent with the small Meissner signal observed (2% of complete flux expulsion) and the broad transition width. These measurements, along with x-ray and critical field results, will be analyzed for the possibility of high T_c superconductivity in these new oxide materials.

1. J. G. Bednorz and K. A. Müller, Z. Phys. B 64, 189 (1986).
2. J. G. Bednorz, M. Takashige and K. A. Müller, Europhysics Lett. Feb. 1987.

11:48

FN 5 Unified Model For Superconductivity, Charge and Spin Density Waves with SU(8) Dynamical Symmetry*. Joseph L. Birman, City College of CUNY, 10031, and Allan I. Solomon Open University, UK.--Unification of mean-field models for the separate, or coexisting cooperative phenomena of superconductivity (singlet, SCC, and triplet, TSC) and charge and spin density waves (CDW, SDW) occurs in SU(8) algebra. Simpler models e.g. (SC + CDW) are included in a chain of subalgebras. In addition to dynamical symmetry, the models possess discrete symmetries giving selection rules causing certain order parameters to vanish. Discrete symmetry will be illustrated on singlet SC - CDW (SO3 x S)3) and singlet-triplet SC + SDW + CDW (SO4 x SO4) models.

*Partially supported by Faculty Research Award Program-CUNY.

12:00

FN 6 Theory of electron-phonon interaction in transition metal binary alloys.* G. FLETCHER, University of Texas at Arlington and P.C. PATTNAIK, IBM Thomas J. Watson Research Center.--Previous work[1] on the Slater-Koster empirical tight-binding approach to the electron-phonon interaction in transistion metals has been extended to binary alloys. The Fermi surface average of the square of the electron-phonon interaction, $\langle I^2 \rangle$, has been calculated. The two-center integral parameters were adjusted for the alloy in a novel way which is based on well-established properties of Slater-Koster parameters in transition metals and explicitly considers the change in lattice constants. Using the computed results and the observed dependence of T_c on alloy concentration, the dependence of $\langle \omega^2 \rangle$ on alloying was predicted. Results will be presented for Mo_xNb_{1-x} and Cr_xV_{1-x}.

*Supported in part by the Robert A. Welch Foundation.
1. P.C. Pattnaik, M. Schabes, and J.L. Fry, to be published.