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between the intercalant in-plane phase and the sample superconducting properties.

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[1]G. Roth et al., Extended Abstracts of Mat.Res.Soc., Symposium I, November 1984.

15:24
BR 8 **Magnetic Phase Transitions in $CoCl_2$-Graphite Intercalation Compounds**+. S.T. CHEN, K.Y. SZETO and G. DRESSELHAUS; MIT— The temperature and magnetic field dependence of the magnetic susceptibility, magnetization and conductivity of $CoCl_2$-GICs have been measured using various techniques. The results of the temperature dependence measurements show two phase transitions occurring at T_{cl} and T_{cu}. Below T_{cl}, the results show that the system is in a 3D phase, the spins coupled ferromagnetically intraplane and antiferromagnetically interplane. A Kosterlitz-Thouless type phase transition for finite size systems occurs at T_{cu}. The system is in a 2D-XY vortex bound phase for $T_{cl} < T < T_{cu}$ and a 2D-XY vortex gas phase for $T > T_{cu}$. This is illustrated for $CoCl_2$-GIC samples with stages 1, 2 and 3. The results of the magnetic field dependence measurements suggest the existence of three magnetic phases at low temperature($T < T_{cl}$): 1) Antiferromagnetic phase for $H < H_{c1}$; 2) Spin-Flop phase for $H_{c1} < H < H_{c2}$; 3)Ferromagnetic phase for $H > H_{c2}$. A magnetic phase diagram for this system is presented.

+Supported by AFOSR Contract F49620-83-C-0011.

15:36
BR 9 Electronic and Magnetic Properties of Stage-3 $FeCl_3$ IGC. A. IBRAHIM, G.O. ZIMMERMAN, K. GALUSZEWSKI, Boston U.*--The magnetic susceptibility (χ) and c-axis conductivity (σ_c) of stage-3 $FeCl_3$ IGC have been measured at temperatures between 1-2°K, and frequencies (40-1000Hz). Both χ and σ_c exhibit anomaly in the form of a sharp peak at temperature near 1.75°K. An external DC field of 50.0G was able to suppress the peak. At 50G, χ was decreasing as the temperature decreased while σ_c was nearly temperatures independent in the range of our measurements. In comparison to stage-6, stage-3 shows asymmetric peaks in both χ and σ_c indicating the stage-dependence of the magnetic interactions. The fact that both χ and σ at the peaks are sensitive to an external field emphasize the existence of a microscopic process which depends on the magnetic property of the system. The nature of this microscopic process, the magnetic ordering within and between the intercalate layers, and scattering and the magnetic state of the system are presented.

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15:48
BR 10 Preliminary Investigation of Crystalline Graphite by (e,2e) Spectroscopy.* J.R. DENNISON and A.L. RITTER. Virginia Polytechnic Institute and State University**--The cross section for (e,2e) scattering provides a direct measure of the energy-momentum dispersion relation in solids, since it is proportional to the spectral momentum density (the probability of finding an electron in the system with a particular energy and momentum). The technique of (e,2e) spectroscopy is well established for investigating atomic and molecular systems, but has been applied less successfully to solids. A recent (e,2e) measurement of amorphous carbon demonstrated that sufficient energy and momentum resolution could be attained to observe the valence band structure in solids[1]. An investigation of crystalline graphite has been undertaken to establish confidence in this new technique and to contrast the spectral momentum densities of amorphous and graphitic carbon. Our results are compared to measurements of graphite band structure from angle-resolved photoemission.

* Submitted by A. L. RITTER.

** Supported by NSF grant #DMR 8204080.

[1] A.L. Ritter, J.R. Dennison, and R. Jones, **Phys. Rev. Lett.** 53,2054 (1984).

16:00
BR 11 Effect of Exfoliation on the Electrical and Mechanical Behavior of Intercalated Graphite. D.D.L. CHUNG, Carnegie-Mellon U. --Exfoliation was found to decrease the electrical resistivity of bromine-intercalated graphite (HOPG) along the c-axis by a factor of about 0.05 and to increase that along the a-axis by a factor of about 200. The reversible change in the c-axis electrical resistance at the exfoliation temperature due to reversible exfoliation allows thermally activated electrical switching. Exfoliation of graphite fibers increases the ductility of the graphite fibers. Applications of exfoliated graphite will be summarized.

16:12
BR 12 Electronic structure of $KHgC_4$. R. J. Brown* and N. A. W. Holzwarth, Wake Forest U. --Using self-consistent local density theory with mixed basis pseudopotential techniques, we have studied the electronic structure of the ternary graphite intercalation compound $KHgC_4$. In order to reduce the computation to a manageable size, we slightly simplified the known[1] crystal structure to one having 12 atoms per unit cell, maintaining the full intralayer geometry and the nearest neighbor interlayer geometry of the correct structure. We also assumed the Hg hexagonal layers to be planar, the simpler of the two possibilities consistent with X-ray data.[1] For comparison, we also studied the electronic structure of the structurally similar pure amalgam $NaHg_2$. Our results indicate that there is substantial charge transfer from the amalgam states to the graphite π bands. However, both amalgam bands and graphite π bands contribute to the Fermi surface, indicating the presence of several types of charge carriers.

*Supported by Wake Forest U. Summer Research Fund.
[1]P.Lagrange, M. El Makrini, and A. Herold, Rev. Chim. Minerale 20, 229 (1983)

16:24
BR 13 Giant Shoenberg Effect (Magnetic Interaction) in a Two-dimensional System, R.S. MARKIEWICZ, M. MESKOOB, and C. ZAHOPOULOS* -- Northeastern University, Boston and National Magnet Lab†. The deHaas-van Alphen (dHvA) magnetization M is a function of the internal field $B=H+4\pi M$, and hence the dependence of M on external field (H_a) must be found self-consistently. Shoenberg[1] showed that this can lead to multivalued $M(H_a)$ curves and phase transitions. In stage-2 Br_2-intercalated graphite, we find evidence of very sharp structure in the dHvA oscillations indicative of such transitions. The structure is extremely sharp (step widths of ≈4G in 60kG) and in conjunction with it we observe a variety of fine structures which had not been anticipated theoretically.

1. D. Shoenberg, Magnetic Oscillations in Metals, (Cambridge, 1984)

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† Supported at MIT by the NSF

16:36
BR 14 The Gibbs Phase Diagram, Charge Exchange, Lattice Expansion, and Staging in Ternary Potassium-Ammonia Graphite Intercalation Compounds.* B.R. YORK and S.A. SOLIN, Michigan State U.--We have studied the charge exchange and composition dependence of the sandwich thickness of stage-1 alkali-ammonia ternary graphite intercalation compounds $K(NH_3)_xC_y$, $0 \le x \le 4.33$, $12 \le y \le 24$. A model of the sandwich energy is presented which explicitly accounts for x-dependent charge exchange and size or stiffness effects and is in excellent agreement with experimental measurements of the dependence of the (00ℓ) x-ray diffraction patterns on ammonia vapor pressure. From this model we find that for the stage-1 compound $K(NH_3)_{4.33}C_{24}$, f = 0.95 and that the NH_3 molecules solvate some of the electron