is interesting to speculate that the correlation effects could possibly also suppress itinerant antiferromagnetism and lead to a first-order transition between a paramagnetic metallic state and an antiferromagnetic insulating state.

The results obtained from Gutzwiller's method are to be contrasted with those found by Hubbard[2] using a Green's-function decoupling approximation. While Hubbard's approximation is reasonable for the insulating phase, it certainly is incorrect for the metallic phase since it does not properly describe the Fermi surface as emphasized by Herring[8] and by Edwards and Hewson.[9] Further, in the Hubbard approximation the density of states at the Fermi surface approaches zero as $C \to C_0$. The Gutzwiller calculation, on the other hand, builds in the Fermi surface from the start and gives an appealing description of a metallic state in which the discontinuity in the single-particle occupation number at the Fermi surface becomes small as the system becomes closer to the metal-insulator transition.

In conclusion, it is interesting to compare the above results with the experimental properties of the metallic state of V_2O_3.[10-12] This type of comparison may be meaningless since V_2O_3 is surely a complicated many-band situation for which the simple model studied by Gutzwiller is not applicable. Nevertheless, the Gutzwiller results are not strongly dependent on the density of states, and it is interesting that the specific heat and the susceptibility appear to be enhanced by roughly the same amount. In V_2O_3 the susceptibility and specific-heat density of states of the metallic phase both appear to be quite large. An extrapolation of the susceptibility to 0 °K gives a value for χ_s, expressed as a density of states, of 35 states/eV molecule. A rough estimate of the specific-heat density of states $N(\epsilon_F)$, can be obtained as follows. If we assume that the difference between the metallic and insulating specific heats is of the form $\Delta C_v = \gamma T + \beta T^3$, then the parameters γ and β can be estimated by setting (a) $\int_0^{T_N} \Delta C_v dT/T = \Delta S$, the change in entropy at the metal-to-antiferromagnetic-insulating phase transition in pure V_2O_3 at 1 atm, and (b) $\Delta C_v(T_N = 170\,^\circ\mathrm{K}) = 0$, in agreement with Anderson's[13] experimental results. This gives $N(\epsilon_F) = 20$ states/eV molecule, which is quite large. However, the ratio $\chi_s/N(\epsilon_F)$ is only 1.75, so that the two quantities appear to be roughly equally enhanced.

The authors would like to thank D. B. McWhan and D. R. Hamann for several useful comments.

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Magnetic Circular Polarization of F-Center Emission in KCl †

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In a recent Letter,[1] the first observation of a magnetic-field-induced circular polarization (MCP) of the emission of F centers was reported for potassium fluoride. Two things were remarkable about the effect: It was quite small, and it appeared to be independent of temperature. The small size implied a strong reduction of the orbital g value for the emitting state, while the temperature independence implied that any spin-orbit contribution to the effect was negligible. In a subsequent paper,[2] it was shown that the F-electron spin polarization had been completely quenched by the intense optical pumping

used in the experiment, so that absence of a spin-orbit contribution was to be expected.

The present note reports new results for the MCP of F-center emission in KCl and an unsuccessful attempt to observe the spin-orbit contribution under different conditions.

The 5145-Å line of a cw argon-ion laser was used to excite the F emission in KCl. The laser power measured at the sample location was about 30 mW, implying a pumping rate of 500–1000 $\sec^{-1}$ for the F-center concentration typical of our measurements. The MCP signal obtained for excitation with unpolarized laser light consisted of a zero-moment change of the F band, very similar to that observed for KF. The signal increased linearly with magnetic field, and was independent of temperature from 1.3 to 4.2 °K. Using the same analysis[1] as for KF, the circular dichroism is

$$(I_+ - I_-)/I = -4g_{\rm orb}\mu_\beta H_z/\delta E, \tag{1}$$

where $g_{\rm orb} = |\langle 2p_y|L_z|2p_x\rangle|$, H_z is the applied field in a [100] direction, μ_β is the Bohr magneton, and δE is the characteristic energy separation between $2s$- and $2p$-like relaxed excited states.[3] The measured value for KCl is

$$\Delta = -(9\pm 1)\times 10^{-8}\, H(\mathrm{G}). \tag{2}$$

Using the recent value $\delta E \simeq 0.017$ eV measured for KCl,[3] this gives

$$g_{\rm orb} = 0.06 \pm 0.01, \tag{3}$$

which is close to the value of 0.04 found for KF.

The search for a spin-dependent contribution was made using intense circularly polarized pumping light. Mollenauer *et al.*[4] and Karlov *et al.*[5] showed that this will lead to a saturation value $\langle S_z\rangle^{\rm sat}$ of the spin polarization which is proportional to the circular dichroism in absorption at the excitation wavelength. This optically induced spin polarization will contribute to the MCP depending on the sense (±) of circular polarization:

$$\Delta_\pm = \frac{-4g_{\rm orb}\mu_\beta}{\delta E}\left(H_z \pm \frac{\lambda^*}{\mu_\beta}\langle S_z\rangle^{\rm sat}\right), \tag{4}$$

where λ^* is the spin-orbit coupling constant for the relaxed excited state. If the sense of circular polarization of the pumping light is reversed, the relative change of the MCP signal will be

$$(\Delta_+ - \Delta_-)/(\Delta_+ + \Delta_-) = \lambda^* \langle S_z\rangle^{\rm sat}/\mu_\beta H_z\,. \tag{5}$$

For the 5145-Å line, $\langle S_z\rangle^{\rm sat}$ should be ~ 0.025 in KCl.[4] At $H_z = 12$ kG the signal-to-noise ratio was such that a 10% change would have been observable, but none was seen. This implies that $\lambda^* < 0.2\times 10^{-3}$ eV, whereas in the "unrelaxed" excited state seen in absorption[6] $\lambda = 6\times 10^{-3}$ eV.

At the present time I cannot offer a satisfactory explanation of the small value of the spin-orbit coupling constant in the relaxed excited state of the F center.

Experimentally the use of a higher-power argon laser would probably improve the sensitivity to the point where the spin-dependent contribution to the MCP could be observed.

†Work supported by the Advanced Research Projects Agency through the Materials Science Center at Cornell University, MSC Report No. 1369.

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Coulomb Effects at Saddle-Type Critical Points, E. O. Kane [Phys. Rev. 180, 852 (1969)]. It was brought to my attention by Y. Petroff that a factor ω^2 was missing in the denominator of Eq. (38). It should also be noted that immediately after Eq. (38), $\langle p^2\rangle_{\rm av}$ should equal $3\langle p_x^2\rangle_{\rm av}$ and Eq. (39) should read $\epsilon_2(\omega) = 6.3\, S_{\rm tot}(\hbar\omega)$. This correction results in an estimated longitudinal-to-transverse mass ratio of − 12 instead of − 60 for CdTe. Theory and experiment are then in better agreement with less need for phonon broadening and a mass ratio which seems more plausible.