

11. Yellow Series Excitons of Cu_2O in High Magnetic Fields

Kaoru Sugimoto

The energy levels of hydrogen like atoms in high magnetic fields are not well known. For the purpose of studying the magnetic field dependence, we investigated a series of absorption lines of the yellow series excitons in cuprous oxide crystals. The series is very similar to that of hydrogen atoms.[1-3]

Experiments were carried out at 4.2 and 1.7 K using an optical multi-channel analyzer, and a grating spectrograph with an inverse dispersion of 13.9 Å/mm. Magnetic fields were generated in a coil immersed in liquid nitrogen by discharging a 200 kJ condenser bank. Absorption spectra were obtained at the flat part near the peak of the magnetic field. Samples immersed in a liquid helium. The Faraday configuration was used.

The Zeeman splitting of 2p,3p,4f,4p and 5f levels were observed. Their gradients were found to be 0.35, 0.34, 0.32, 0.33 and 0.32 cm^{-1}/T , respectively. The repulsion of absorption lines of the 4p and 5f levels were observed. A minimum difference occurred at $B = 16.7 \text{ T}$ and the difference was 9.0 cm^{-1} . The minimum energy separation were calculated from its field strength, taking into account of a diamagnetic term. The calculated result was 7.7 cm^{-1} which was in a good agreement with experimental value of 9.0 cm^{-1} .

References

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