

of the mixed crystals have pressure coefficients measurably less than the respective band gap. As concluded previously¹ this fact makes it unlikely that the luminescent transition originates directly from the conduction band. Apparently, donor-acceptor luminescence is the dominant mode of radiative recombination.

A qualitative understanding of the observed intensity changes with pressure for the mixed crystals can be achieved through a donor-acceptor model. As has been stated the donor depth becomes shallower as the cadmium concentration is increased. The acceptor level is unaffected. Experimental results presented for the ZnS phosphors have shown the effect of pressure to be to increase the ionization energy of the chlorine donor ($\sim 32 \text{ cm}^{-1}/\text{kbar}$). Experimental data from Böer *et al.* have indicated that donor ionization energies in CdS increase by roughly $64 \text{ cm}^{-1}/\text{kbar}$.⁸ These observations make it likely that the donor pressure coefficient in a zinc-cadmium sulfide mixed crystal will be somewhere between these limits. If this is the case, then it is expected that pressure will decrease the emission intensity to a

greater extent as the Cd^{2+} concentration is increased. This argument follows from the overlap considerations presented in the previous paper¹ for the ZnS donor-acceptor type emissions. The data for the silver-doped sample at all pressures and the copper-doped sample at pressures greater than 20 kbar bear this out. The anomalous behavior in the copper-doped sample below 20 kbar is not understood.

¹G. L. House and H. G. Drickamer, J. Chem. Phys. 67, 3221 (1977).

²W. Hoogenstraaten, Philips Res. Rep. 13, 515 (1958).

³H. W. Leverenz, *An Introduction to Luminescence of Solids* (Dover, New York, 1968).

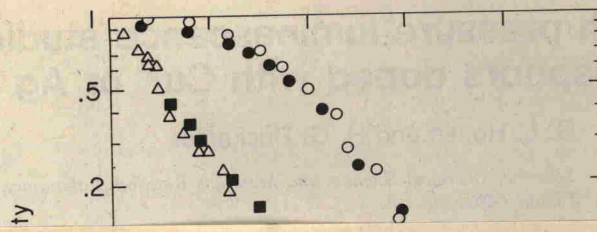
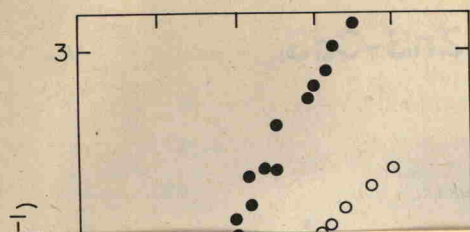
⁴S. T. Henderson, P. W. Ranby, and M. B. Halstead, J. Electrochem. Soc. 106, 27 (1959).

⁵S. Rothschild, J. Electrochem. Soc. 110, 28 (1963).

⁶E. B. Fehr, A. I. Friedman, F. J. Studer, and G. R. Fonda, J. Opt. Soc. Am. 42, 917 (1952).

⁷G. A. Samara and A. A. Giardini, Phys. Rev. 140, 388 (1965).

⁸K. W. Boer, E. Gutsche, and E. Jahne, Phys. Status Solidi 3, 922 (1963).



of the initial crystals have greater concentrations of the donor-acceptor complex than the rest of the crystal. As the pressure increases, the donor-acceptor complex becomes more numerous and the intensity of the luminescence increases. The donor-acceptor complex is the dominant mode of radiative recombination.

A qualitative understanding of the observed changes with pressure for the initial crystals can be obtained through a donor-acceptor model. As the pressure increases, the donor-acceptor complex becomes more numerous and the intensity of the luminescence increases. The donor-acceptor complex is the dominant mode of radiative recombination.

Experimental results presented in this paper show that the effect of pressure on the luminescence of ZnS-CdS is to increase the intensity of the luminescence. This is in contrast to the results of other workers who have reported a decrease in intensity with pressure. The present results indicate that the donor-acceptor complex is the dominant mode of radiative recombination in ZnS-CdS. The present results also indicate that the donor-acceptor complex is the dominant mode of radiative recombination in ZnS-CdS.