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Light-Induced Electron Paramagnetic Resonance of $^2S_{1/2}$ -State Impurity Centres in CdS and CdSe Single Crystals

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Recently $^2S_{1/2}$ -state impurities with (ns)¹-configuration have become an interesting object of EPR investigations in II-VI compounds. Rüber and Schneider (1) observed spectra of Group-III elements, Sugibuchi and Mita (2, 3) the spectra of Group-IV elements in ZnS, and Suto and Aoki (4, 5) found spectra of Pb-associated centres in ZnTe. From the extremely large hyperfine splitting by the nuclear spins of some isotopes of the impurity centres, Rüber and Schneider, and also Sugibuchi and Mita concluded that the unpaired spin is strongly localized in the (ns)-orbital of the impurity ion. In contrast to the observations in ZnS, the investigations in Pb:Pb and ZnTe:Ge (6) show large g-shifts to values greater than the free-spin value and an additional superhyperfine structure, caused by the interaction with the nuclei. Suto and Aoki (7), and Iida and Watanabe, who calculated the probability of finding the unpaired spin in the (ns)-orbital of only 0.23 for Ge and 0.19 for Pb (8), concluded that the paramagnetic centre is a hole, localized mainly on the four Te atoms around the Ge or Pb ion.

To get further information about the nature of these centres we extended the measurements to single crystals of CdS and CdSe with wurtzite structure. The EPR measurements were performed with an X-band rf-modulated JEOL spectrometer JES-3BQ. The samples were prepared by two methods. Either by growing single crystals of CdS and CdSe with the doping material or by growing the crystals from highly purified CdS and CdSe powder with an admixture of the doping material. In both cases strong EPR-spectra were observed at 77 °K after excitation with light in the visible range from an ordinary prism monochromator