

EPR OF Mn^{2+} IN GLASSES OF THE SYSTEMS $ZnO-Al_2O_3-B_2O_3$
AND $CaO-Al_2O_3-B_2O_3$

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EPR of Mn^{2+} in Glasses of the Systems $ZnO-Al_2O_3-B_2O_3$
and $CdO-Al_2O_3-B_2O_3$

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ABSTRACT

Using an ALX-10 spectrometer, we did carried out an electron spin resonance study of B_2O_3 -ZnO- Al_2O_3 and B_2O_3 -CdO- Al_2O_3 glasses. Our probe was a manganese ion. For each composition we made three samples. To one of them we added 1.0% Mn^{++} , to the second we added 0.1% Mn^{++} , and to the third, we added no manganese. Our aim is to get some information about the effect of the atomic radii on the zero field tensor \vec{D} . We found that for low concentrations of Zn^{+2} or Cd^{+2} (i.e. less than 10%), the spectrum is a singlet centered at $g = 2.00$ with no peaks at $g = 3$ or at $g = 5$. When the concentration increased those peaks are found. On the other hand, when we varied the concentration of Al^{+3} , we found that the peaks at $g = 3$ and $g = 5$ are absent even for the maximum allowable concentration of Al^{+3} . We measured the signal heights of the $g = 3$ and $g = 5$ lines and compared them to the one at $g = 2$. We found that those ratios increase with increasing the concentration of the large radii elements (Zn^{++} and Cd^{++}), but the positions of these peaks do not change with the concentration. Also we found that the hyperfine structure is more resolved in the 0.1% Mn^{+2} than the corresponding 1.0% Mn^{+2} samples. The purpose of including the samples with no Mn^{+2} is to rule out all the background which is not due to the presence of Mn^{+2} by subtracting it from the corresponding 1.0% Mn^{+2} and 0.1% Mn^{+2} samples. We found that when ions with large radii are added to the glass, they distort the symmetry around the Mn^{++} ion, and this gives rise to the E-term which is responsible for making the \vec{D} -tensor completely symmetrical.