Identification of the Fe^{3+}-Center in ZnS

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In not intentionally doped ZnS crystals new luminescence transitions consisting of narrow zero phonon lines and their phonon replicas has been detected in the spectral range of 1,2 µm (Fig. 1). From magneto-optical studies a perfectly resolved sixfold splitting of all lines with g-values near 2 has been observed which can be attributed to the ground state. The excitation spectra of this new 1.2 µm luminescence are in good agreement with the photo-absorption spectra of ZnS:Fe.[1] From this and in comparison with the spectra of other $3d^5$-transitions it results that only a $^4T_1 \rightarrow {}^6A_1$ Fe^{3+}-transition can be responsible for the detected luminescence structures. The decay time of the emission is measured to be about 1msec. Since this transition is spin forbidden this relatively long decay time becomes understandable. Experiments on crystals intentionally doped with Fe^{54} and Fe^{57} isotopes will finally prove this assumption. Results will be presented at the conference.

[1] H. Zimmermann, R. Boyn, and N. Nagel: phys. stat. sol. (b) 117, 229 (1983).
[2] C. Benecke, W. Busse, H.-E. Gumlich, and U. Pohl: phys. stat. sol. (b) 128 (1985), 701.

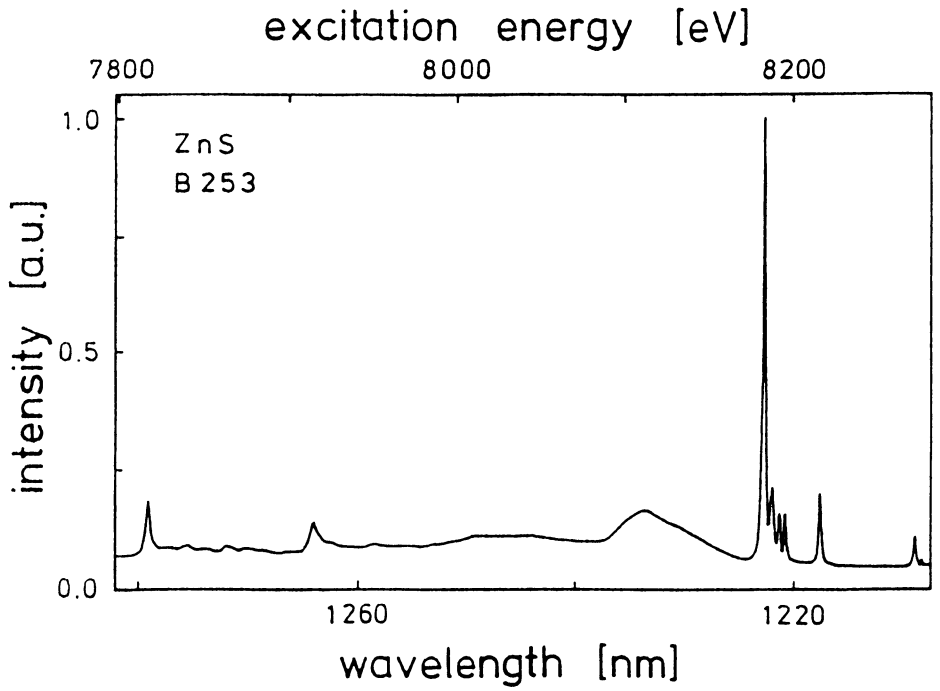

Fig. 1: Typical luminescence spectrum of ZnS in the spectral range of 1.2 µm.