ELSEVIER

Journal of Crystal Growth 138 (1994) 1073–1074

JOURNAL OF CRYSTAL GROWTH

Late News

The influence of nitrogen on the p-conductivity in ZnSe epilayers grown by molecular beam epitaxy

A. Hoffmann [a], B. Lummer [a], L. Eckey [a], V. Kutzer [a], Ch. Fricke [a], R. Heitz [a], I. Broser [a], E. Kurtz [b], B. Jobst [b], D. Hommel [b]

[a] *Institut für Festkörperphysik, Technische Universität Berlin, Hardenbergstrasse 36, D-10623 Berlin, Germany*
[b] *Physikalisches Institut, Universität Würzburg, Am Hubland, D-97074 Würzburg, Germany*

The relation between the incorporation of nitrogen into ZnSe/GaAs epilayers grown by molecular beam epitaxy (MBE) and the resulting p-conductivity is not fully understood to date. Native point defect reactions are believed to strongly interfere with the control of carrier type and conductivity. Our MBE samples were grown on p-type (100) GaAs:Zn substrates in a 4-chamber system using elemental sources for Zn and Se with a Se/Zn flux ratio of 2:1. N was incorporated during growth using a plasma source. Varying the substrate parameters we are able to produce p-type or n-type conductivity. We present time-integrated and time-resolved photoluminescence (PL) measurements yielding new information on the incorporation mechanisms of N into p-type ZnSe epilayers.

Spectra of n-type and weakly p-type samples exhibit bound exciton (BE) and donor–acceptor pair (DAP) luminescence (cf. Fig. 1). From their energies the BE emissions are attributed to the decay of excitons bound to a Ga donor (I_2), a N acceptor (I_1^N), and to a complex of a Zn vacancy and interstitial Ga (I_1^C), evidencing interdiffusion of Ga and incorporation of N on Se sites. This is supported by the fact that samples grown at higher temperatures tend to be n-type. The DAP luminescences around 2.70 eV are consistent with a N acceptor level between 100 and 110 MeV. With higher N concentrations and $N_A - N_D \geq 1 \times 10^{17}$ cm^{-3}, instead of BE and DAP luminescences a new broad band appears around 2.63 eV. However, time-resolved PL proves the DAP character

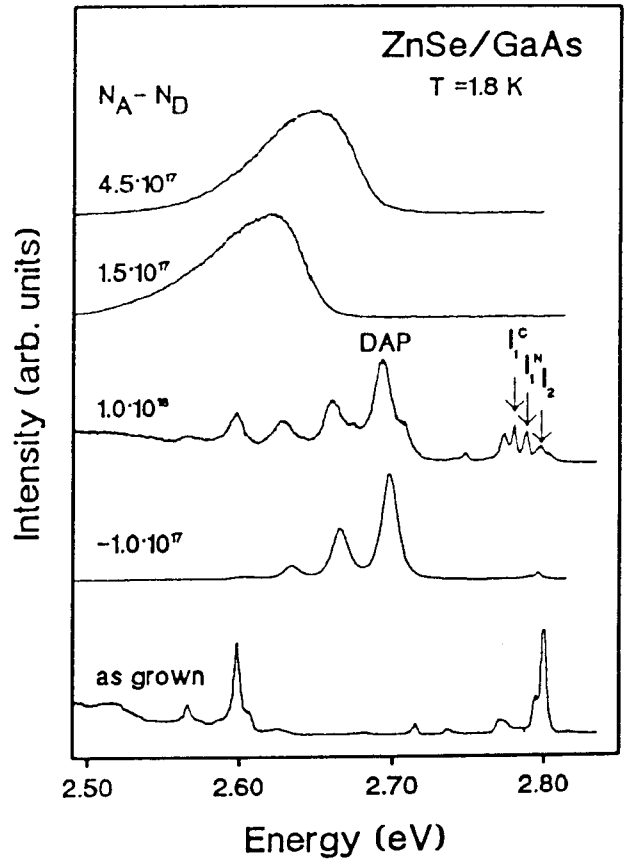

Fig. 1. Luminescence of N-doped ZnSe/GaAs in the band edge region.

SSDI 0022-0248(94)00017-G