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Report: Gallium nitride is one of the most widely studied semiconductors due to its potential blue laser applications. One of the basic question has been the structural stability during the long-term emanation of laser light. The other important parameter is the defect mechanism which has been studied using positron annihilation technique. Both of these properties are related to the bonding mechanism of this wide-gap semiconductor.

We have started a program to study the character of bonding in GaN and in the next case Zn(Mg)Se which is another blue laser candidate. The method we are using is high resolution Compton scattering which is not sensitive to the crystal defects and is particularly useful the studies of the properties of the valence electrons [1].

GaN single crystal was grown in Nicolaus Copernicus University, Torunn, Poland. This is so far the only place where the appropriate technology has been worked out. A conventional Compton scattering set up, based on the use of $WK\alpha_1$ radiation in Helsinki University was first used for preliminary studies. The actual directional Compton profile experiment was made at ID15 (BL 25) using both solid state detector and high resolution scanning spectrometer. Because sample was thin both reflection and transmission geometry's were used to make measurements with the scattering vector perpendicular to [100], [001] and [110] planes.

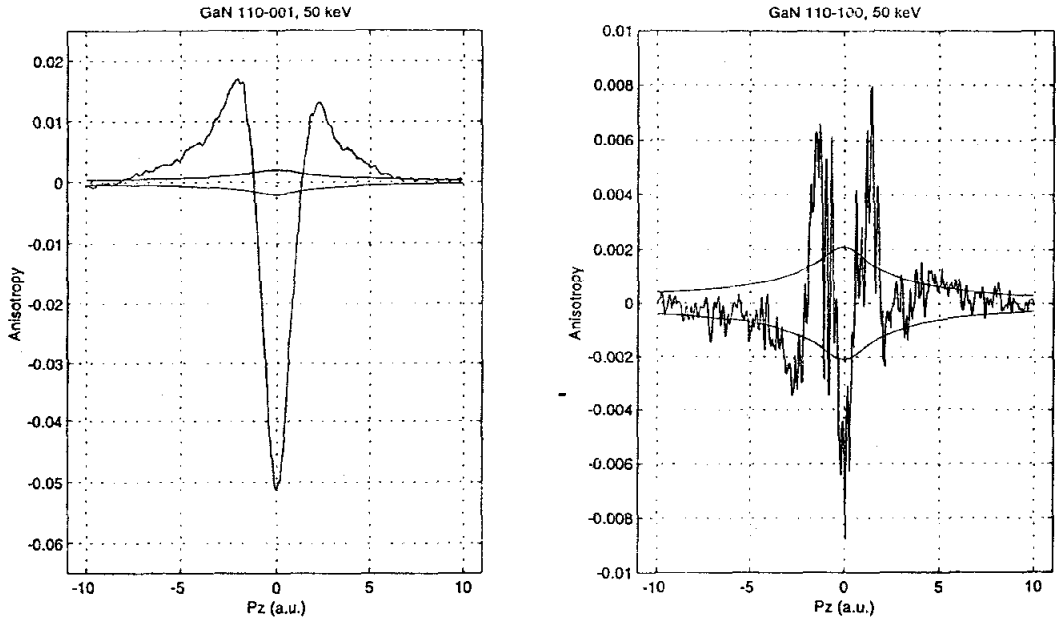

Figure 1.

The experimental momentum density anisotropy is shown in Fig. 1. As expected the difference between the c-axis and the basal plane is significantly larger than the difference taken in the basal plane. A band structure calculation of GaN is in progress [2]. We have also already measured Zn(Mg)Se single crystals and the comparison between these two wide-gap systems, analyzed in terms of the band structure would give light to the electronic momentum density of these technologically interesting materials

[l] Cooper, M.J., Rep.Prog.Phys. 48,415 (1985)
[2] Rabii, S., private communication