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## TEM investigations of structural and chemical order in III-N semiconductors irradiated by swift heavy ions

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The nitride semiconductors, (Ga,In)N, which display optical and electronic properties, intend to become one of the next-generation technology for space exploration [1]. Such application requires studying the behavior of these materials under cosmic radiation, hence InN and GaN specimens were irradiated at the GANIL facility with 950 MeV Pb and 1,4 GeV U.

These structural and chemical changes induced by swift heavy ions were investigated through transmission electron microscopy (TEM). High resolution TEM investigations were performed to identify the structural order along the ion tracks and the strain induced in the lattice neighboring the ion tracks [2]. Chemical investigations were carried out by STEM - Electron Energy Loss Spectroscopy (EELS) to describe the chemical order in the neighboring and inside the ion path.

Discontinuous tracks in GaN samples and a density fluctuation around the track were identified by STEM HAADF. Chemical profiles plotted across ion tracks indicate a decrease of gallium rate within the ion path while higher density of gallium is clearly observed outside the track. Furthermore, the nitrogen k near-edge fine structure investigation reveals the encapsulation of nitrogen bubbles inside the ion tracks.

[1] Ackermann J., Angert N., Neumann R., et al. Nucl Instrum Methods Phys ResB, 1996, vol. 107, no 1-4, p. 181-184.

[2] Sall, M., Monnet I., Moisy, F. et al. Journal of Materials Science, 2015, vol. 50, no 15, p. 5214-5227.

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