# P35: Beam damage free sample investigations of GaN related materials employing cathodoluminescence

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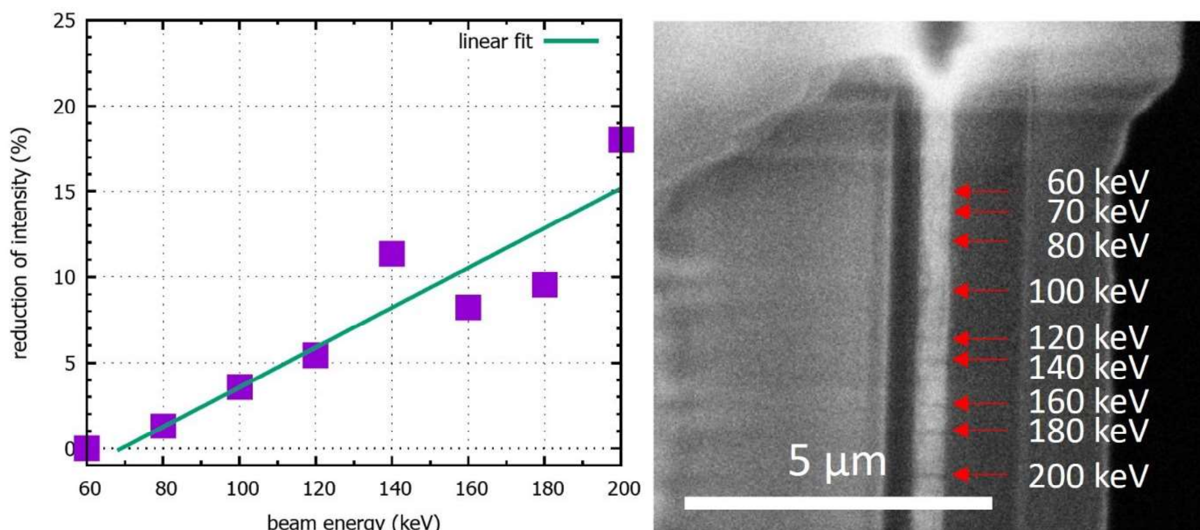
In order to be able to analyse semiconductor materials in the scanning transmission electron microscope (STEM) using cathodoluminescence (CL), a number of requirements must be considered [1]. One of those is beam damage, which is not always visually apparent. While examining specimens, beam damage may only become evident when the specimen ceases to emit light. This phenomenon occurs due to atomic displacements induced by the beam, leading to the creation of various gap states. Consequently, excited electron-hole pairs can recombine radiation-free, rendering the damage detectable only when light emission ceases.

In the present study, we investigate beam damage with respect to beam energy while keeping the beam current constant at 0.8 nA within 5% accuracy. We show the reduction of luminosity once as a plot and second as a panchromatic image. The red arrows point to the positions of the measurements, which are invisible to the naked eye below 100 keV. As the damage threshold energy of 69.6 keV is determined, this is in excellent agreement with prior work by Griffith et al. [2]. Furthermore, we find that below the damage threshold the beam current does not matter and even 10 nA at 60 keV does not change the electronic structure of the luminescent layer.




[1] Stöger-Pollach, M, Bukvišova, K., Zenz, K. Stöger. L., Scales, Z. (2023) J Mic., DOI: 10.1111/jmi.13242
[2] Griffith, J.T., Zhang, S. Lhullier, J., Zhu, D., Fu, W.Y., Howkins, A., Boyd, I., Stowe, D., Wallis, D.J., Humphreys, C.J., Oliver, R.A. (2016) J Appl. Phys.