Gastkolloquium
Center for Surface- and Nanoanalytics Linz

Zentrum für Oberflächen- und Nanoanalytik

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Analysis of pump-probe absorption edge spectroscopy on cubic GaN

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Time-resolved pump-probe spectroscopic ellipsometry studies are performed on a 600 nm thin-film sample of zincblende gallium-nitride (zb-GaN, direct band gap of 3.23 eV), revealing an ultra-fast change of the absorption onset of ~500 meV within 1 ps. The absorption of the 266 nm (4.66 eV) pump-beam induces a free charge carrier profile within the zb-GaN layer. These free-carriers influence the dielectric function due to many-body effects like band gap renormalization and Burstein-Moss shift. Accounting for processes that influence the free-carrier concentration at the conduction band minimum like relaxation, recombination and diffusion, we are able to determine a position- and time-dependent approximation of those carrier concentrations. Expanding on this model enables an accurate analysis of the experimental data by considering layered dielectric functions within the zb-GaN.

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