Growth of *M*- and *A*-plane GaN on $LiGaO_2$ by plasma-assisted MBE

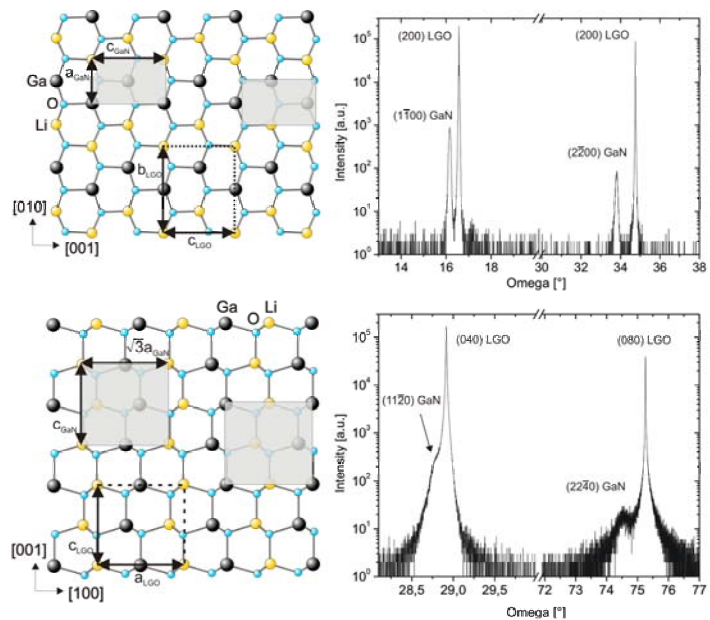
R.Schuber[1, 2 *], M. M. C. Chou[3], P. Vincze[4], Th. Schimmel[1, 4], and D. M. Schaadt[1, 2]

[1] *Institute for Applied Physics, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*
[2] *DFG-Center for Functional Nanostructures (CFN), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*
[3] *Department of Materials Science and Opto-electronic Engineering, National Sun Yat-Sen University, Kaohsiung, Taiwan, ROC*
[4] *Institute of Nanotechnology, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*

Group III nitrides grown along the <0001> direction show a strong quantum confined Stark effect due to the electric fields resulting from the spontaneous and piezoelectric polarization. These fields cause a reduction of the oscillator strength due to a spatial separation of electrons and holes and a decrease in the energy of the radiative transition.

Epitaxial layers with non-polar surfaces such as the *M*-plane {1-100} and *A*-plane {11-20} are attractive due to the absence of built-in electrical fields in growth direction. Since non-polar GaN substrates are not readily available for homoepitaxy, various alternative substrates have been examined for growth of high quality *M*- or *A*-plane GaN crystals. $LiGaO_2$ (LGO) presents the closest lattice matched substrate that has been considered for GaN heteroepitaxy. However, so far only *C*-plane {0001} growth of GaN has been reported on (001) LGO.

Here we present growth of *M*-plane GaN on (100) LGO[1] and *A*-plane GaN on (010) LGO[2] for the first time using plasma-assisted molecular beam epitaxy. We found annealing of the substrates to be an important step to ensure film stability, i.e. to prevent a pealing off of the substrate. Structural and morphological analysis was performed using x-ray and reflective high energy electron diffraction as well as scanning electron and atomic force microscopy. Within the sensitivity of the measurements phase purity of the grown films is shown to be very high. Substrate scratches present prior to growth were still visible but clearly smoothed. Disregarding the scratch-induced roughness the surface morphology of both films is shown to be flat (rms < 10 nm over 8×8 µm²).



[1] R. Schuber, M. M. C. Chou, and D. M. Schaadt, submitted to Thin Solid Films (2009)
[2] R. Schuber, M. M. C. Chou, P. Vincze, Th. Schimmel, and D. M. Schaadt, accepted for J. of Cryst. Growth (2010)

*R.Schuber, e-mail: ralf.schuber@kit.edu, Tel: +49-721-608-3572