

Strain and compositional fluctuations in AlInN/GaN

heterostructures — •Verena Portz¹, Michael Schnedler¹, Martial Duchamp^{1,2}, Fei-Man Hsiao^{1,3}, Holger Eisele⁴, Jean-François Carlin⁵, Raphael Butté⁵, Nicolas Grandjean⁵, Rafal E. Dunin-Borkowski^{1,2}, and Philipp Ebert¹ — ¹Peter Grünberg Institut, Forschungszentrum Jülich GmbH, 52425 Jülich, Germany — ²Ernst Ruska-Centrum, Forschungszentrum Jülich GmbH, 52425 Jülich, Germany — ³Department of Physics, National Sun Yat-sen University, Kaohsiung 80424, Taiwan — ⁴Institut für Festkörperphysik, Technische Universität Berlin, Hardenbergstraße 36, 10623 Berlin, Germany — ⁵Institute of Physics, Ecole Polytechnique Fédérale de Lausanne, 1015 Lausanne, Switzerland

The strain and compositional fluctuations of nearly lattice-matched AlInN/GaN heterostructures are investigated by cross-sectional scanning tunneling microscopy and selected area electron diffraction measurements in scanning electron transmission microscopy. The presence of strain induces height modulations governed by different roughness components at the cleavage surfaces. The surface height modulations are compatible with a relaxation of alternately compressive and tensile strained domains, indicating compositional fluctuations. Changes of the lattice constant are traced to interface misfit edge dislocations. The dislocations induce steps increasing the roughness within the AlInN layers.