MM 26: Topical Session TEM VII

Time: Wednesday 14:30–15:30 Location: IFW B

Topical Talk MM 26.1 Wed 14:30 IFW B

Electron Holography for structures and fields at a nanoscale — •Hannes Lichte[1], Dorin Geiger[1], Andreas Lenk[1], Martin Linck[1,2], Axel Lubk[1,3], Falk Roeder[1], John Sandino[1,4], Jan Sickmann[1], Karin Vogel[1], and Daniel Wolf[1] — [1]Triebenberg Laboratory, Institute for Structure Physics, TU Dresden, 01062 Dresden, Germany — [2]National Center for Electron Microscopy Lawrence Berkeley National Laboratory One Cyclotron Road, MS 72-150 Berkeley, CA 94720 — [3]CEMES-CNRS - Groupe NanoMatériaux 29, rue Jeanne Marvig B.P. 94347 F-31055 Toulouse Cedex — [4]Facultad de ciencias Universidad Nacional de Colombia Sede Bogota, Colombia

TEM is the method of choice for analysis of materials at atomic scale at point resolution below 0.1nm allowing interpretation of positions of atoms e.g. at interfaces. However, the phases are lost, and hence the electric and magnetic fields in the object. Phase-loss is overcome by electron holography [1]. This allows access to **Inner Potentials in solids **Functional potentials such as pn-junctions **Electric fields controlling growth in biominerals **Depolarizing fields in ferroelectrics **Magnetic fields in magnetic structures **difference of atomic numbers **number of atoms in an atomic column **Coherence of inelastically scattered electrons Lateral resolution of 0.1nm is reached. Phase resolution presently is about 2p/70, just at the edge for detecting interatomic electric fields. [1] H. Lichte, M. Lehmann, Rep. Prog. Phys. 71 (2008), 016102. Funding by DFG,German-Israel Funds (GIF), European Union (Framework 6 Integr. Infrastruct., Reference 026019 ESTEEM).

MM 26.2 Wed 15:00 IFW B

Strain mapping of strained transistors by dark-field off-axis electron holography — •Jan Sickmann[1], Hannes Lichte[1], Holm Geisler[2], and Hans-Jürgen Engelmann[2] — [1]Triebenberg Laboratory, Institute for Structure Physics, TU Dresden, 01062 Dresden, Germany — [2]Globalfoundries Dresden, Center for Complex Analysis, 01109 Dresden, Germany

Dark-field off-axis electron holography in a TEM has been proven to measure the two-dimensional strain distribution in semiconductor devices at nanometer scale resolution [1]. The technique is based on the interference of diffracted waves from adjacent sample areas using the dark-field off-axis holography configuration [2]. The phases of the diffracted waves then give direct access to local changes in the lattice parameter [1]. We present recent results of strain measurements on state-of-the-art transistor structures manufactured by Globalfoundries Dresden. Applying specific holographic setups at an aberration corrected Tecnai F20 TEM lead to significant improvements in lateral resolution and signal resolution of the two dimensional strain maps. Since the variations of the lattice strain relative to the original lattice parameter are often expected to be less than 1%, possibilities for optmizing the signal properties are discussed. [1] M. J. Hÿtch, F. Houdellier, F. Hüe, and E. Snoeck, Nature London 453, 1086 (2008). [2] K.-J. Hanszen, J. Phys. D: Appl. Phys 19, 373 (1986).

MM 26.3 Wed 15:15 IFW B

Untersuchung struktureller und optischer Eigenschaften von getemperten InGaNAs-Trögen mittels TEM-Dreistrahl-Abbildung — •Robert Imlau[1], Knut Müller[1], Marco Schowalter[1], Bernardette Kunert[2], Rafael Fritz[2], Kerstin Volz[2], Wolfgang Stolz[2] und Andreas Rosenauer[1] — [1]Universität Bremen, D-28359 Bremen — [2]Universität Marburg, D-35032 Marburg

In diesem Beitrag werden strukturelle und optische Eigenschaften von $In_{0.2}GaN_{0.024}As$-Quantentrögen vor und nach einer Temperaturbehandlung unter N_2 Atmosphäre bei 600°C untersucht und verglichen. Die Messung von Stickstoff- und Indiumkonzentration basiert auf der Auswertung von Verzerrung und chemisch sensitivem Kontrast in einer TEM-3-Strahlabbildung der Reflexe 000, 200 und 220. Alle Bilder wurden an einem Cs-korrigierten Titan 80/300 aufgenommen. Proben homogener Dicke wurden mittels FIB und Niederenergie-Ionenmühle präpariert. Absorptionsmessungen zeigen eine Blauverschiebung der Bandlücke von 38 ± 7 meV nach dem Tempern. Da die mittels 3-Strahlabbildung erhaltenen In- und N-Konzentrationsprofile keine langreichweitige Umverteilung beider Elemente zeigen, wird die beobachtete Blauverschiebung u.a. im Hinblick auf bevorzugte In-N Koordination nach der Temperung diskutiert.