s5.m2.o1 Strain and Morphology in Nano-Patterned Semiconductors. T. Baumbach, D. Lübbert, C. Giannini[+], J. Eymery[*]. *Fraunhofer Institut für Zerstörungsfreie Prüfverfahren, Krügerstr. 22, D-01326 Dresden, Germany. [+] Centro Nazionale per Ricerca e lo Sviluppo dei Materiali (PASTIS-CNRSM), S.S. Appia km 7+300, I-72100 Brindisi, Italy. * CEA/Grenoble DRFMC/SP2M/PSC 17, rue des Martyrs, F-38054 Grenoble cedex 9 - France*
Keywords: semiconductors, surface gratings, quantum structures.

Presently artificial structuring in nanometer scale holds a great potential for new micro- and opto-electronic devices (e.g. gratings, etched quantum wires and quantum dots, self assembled patterning in strained superlattices).

Usually the fabrication of lateral semiconductor nano-structures consists of planar growth followed by direct patterning via lithography and subsequent etching, or of the growth on directly patterned substrates.

A third alternative approach is based on strain-driven self-organization phenomena, as observed during the growth of strained layer superlattices grown on vicinal surfaces. Another promising way to stimulate self-organized growth is realized by a periodic strain field induced by an interface dislocation network.

The talk reports high resolution X-ray scattering techniques for the structure characterization of such periodic nano-structures. The methodical potential will be demonstrated discussing results concerning

- the evolution of residual lattice strain in buried quantum wires during the technological steps of planar growth, patterning and subsequent embedding
- periodic interface strain in ultra-thin twist bonded samples
- the interface morphology, the lateral correlation and vertical replication properties in the case of strain-driven self-assembled patterning.

s5.m2.o2 Detection and chemical analysis of nanophases at grain boundaries by high resolution and energy filtered electron microscopy. J.M. Pénisson[1], M. Bacia[2] and T. Vystavel[3]. [1] *Département de Recherche Fondamentale sur la Matière Condensée/SP2M/ME CEA - Grenoble, 17 Av. des Martyrs, 38054 Grenoble Cedex 9, France.* [2]*Université des Sciences et Technologies de Lille Lab. de Structures et Propriétés de l'Etat Solide 59655 Villeneuve d'Ascq Cédex France* [3] *Institute of Physics, Academy of Sciences of the Czech Republic, Na Slovance 2, Praha 8, Czech Republic*.
Keywords: electron microscopy, chemical mapping, grain boundaries.

The physical properties (mechanical or electrical) of materials are strongly dependant on the presence of defects. The knowledge of their structure and chemistry is then necessary to understand in detail their behavior under the influence of external factors. Electron microscopy is one of the most popular tools used to solve this problem. Modern microscopes have now a resolution power allowing the observation of the atomic structure of many materials and they can be fitted with very powerful nano-analysis attachments so that the structure as well as the chemistry can be determined with a very good accuracy.

Specially designed bicrystals have been used to study the intrinsic structure of the pure tilt boundaries in molybdenum. The experimental images are quantitatively compared to calculated models of the different boundaries and all the parameters of the boundaries such as rigid body translation and expansion are measured. The same bicrystals have been subjected to heat treatments in presence of impurities such as carbon and nickel. Their respective effect on the grain boundary structures is studied by high resolution and by chemical imaging. It will be shown that carbon segregates at the boundary core. The nickel has a different behavior. Depending on the relative energy of the boundaries some of them contain a wetting layer while others are not affected. The coherent ?=3 twin boundary has a low energy and only a small nickel segregation is found at the core of secondary dislocations, the boundary itself does not contain nickel. At the opposite, the ?=11 boundary has a high energy and a thin layer of the crystalline Ni-Mo ? phase is present. These results are in agreement with the thermodynamic theories of the wetting of grain boundaries in metallic systems.