UNIVERSITÄT OSNABRÜCK

# Seminar Oberflächenphysik / NanoScience

## Vortragsankündigung

**Tjeerd Bollmann**
Physics of Interfaces and Nanomaterials, MESA+ Institute for Nanotechnology, Enschede, The Netherlands

## „In-situ observations of electronic growth on Ni(111) using Low Energy Electron Microscopy“

Freitag, 18.02.2011
10:00 Uhr
Raum 32/372

To grow new materials, epitaxial growth has been very successfull over the years. Understanding the physics that lead to Volmer-Weber, Stranski-Krastanov or Frank-van der Merwe growth modes makes it possible to control uniform film growth. Creating nanostructures with an extra dimension is however far more challenging and also of great technological importance.
Self-organization due to quantum size effects often leads to preferred island heights referred to as quantum growth or electronic growth and has been observed for ultrathin films of Pb on various substrates. Pb(111) films are of special interest since every bilayer increment of the film thickness accommodates three additional antinodes of the Fermi wavefunction and causes therefore a quasi bi-layer oscillation in the thin film stability and its physical properties. Initially the odd layers (3, 5, 7, 9, 11 and 13) are preferred, crossing over to even layers (14, 16, 18, 20 and 22) caused by a slight deviation of the Pb-Fermi wavelength compared to the interlayer spacing. From monoclinic bulk Bi, electronic growth is not expected due to the large Fermi wavelength. $Bi(111)_{rhom}$ films however are very comparable since their Fermi wavelength is comparable.
Using low energy electron microscopy (LEEM) and selected area low energy electron diffraction (µLEED) we investigate in-situ the formation, stability and structure of both Pb- and large Bi-mesas during and after growth on Ni(111) at RT and above. Both for Pb and Bi a (7 × 7) wetting layer is formed on the Ni(111) substrate, where for Pb the stress is accommodated by the formation of another domain type. For Pb on Ni(111) in vivo bi-layer growth is observed, resulting in spectacular mass transport (across atomic steps). Above 525 K these metastable mesas (composed of over 109 atoms) reshape from quasi-twodimensional mesas to fully three-dimensional hemispheres within only a few milliseconds! For Bi on Ni(111) a subtle interplay between electronic growth and compressive strain leads to structures with preferred layer heights and different stability.

gez. J. Wollschläger / M. Reichling