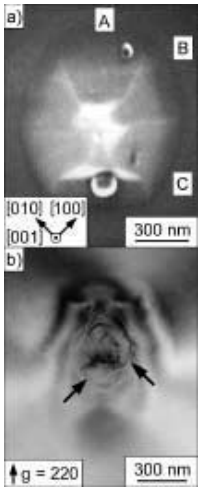
s5.m2.p1 **Structural investigation of MOCVD grown GaSb islands by TEM.** H. Kirmse[1], W. Neumann[1], L. Müller-Kirsch[2], U.W. Pohl, D. Bimberg[2], [1]*Humboldt University of Berlin, Institute of Physics, Chair of Crystallography, Invalidenstrasse 110, D-10115 Berlin,* [2]*Technical University Berlin, Institute of Solid State Physics, Hardenbergstrasse 36, D-10623 Berlin, Germany.*
Keywords: electron crystallography, nano-structured materials, microanalysis.

The materials system GaSb/GaAs has been studied with respect to the generation of low-dimensional nanostructures. Owing to their optical properties these nanometre-sized structures are of particular interest for wavelength-tunable and storage devices. The lattice mismatch of about 7 % between GaSb and GaAs is similar to that of the system InAs/GaAs exhibiting self-organization phenomena yielding quantum dots on a few monolayers thick wetting layer (Stranski-Krastanov growth mode).

The GaSb structures (layers, quantum dots, and islands) were grown on GaAs(001) substrates by metal organic vapor phase deposition (MOCVD). The substrate temperature (T=510..550°C), GaSb growth duration (t=20..45s) and time of growth interruption after GaSb deposition (t_{GRI}=0..50s) were varied to find out optimum conditions for the formation of quantum dots. Finally, the deposited GaSb was capped with a 50 nm thick GaAs layer. The information about the size, shape, relaxation status and 2-dimensional distribution (i.e. regularity and area density) of the islands was gained using transmission electron microscopy (TEM) and scanning electron microscopy (SEM).



Depending on the growth conditions either a single layer, a layer with quantum dots or a layer with large islands were formed In general, the longer the growth interruption and the higher the temperature, respectively, the greater is the probability of the formation of islands. For T=510°C and t_{GRI}=5s a GaSb-rich layer of about 1 nm thickness was found by high resolution TEM imaging. However, large relaxed islands of about 1µm lateral size were observed for both parameter settings T=550°C, t_{GRI}=5s as well as T=525°C, t_{GRI}=50s. The SEM image of Fig. a) reveals the idiomorphic shape typically for the µm-sized islands. The facets were identified to be A: $\{11l_1\}$ and B,C: $\{52l_2\}$ taking into account the angles between the edges of the basal plane of the pyramid.

Fig. b) shows a TEM bright-field image of an island grown at T=525°C with t_{GRI}=20s. Depending on the size of the islands and the growth temperature the strain due to the lattice mismatch is compensated by the formation of either dislocation loops (marked by arrows in Fig. b) or by a dislocation network which was observed for T>540°C.

s5.m2.p2 **Nanostructured thin metallic films in the Renaissance Italian pottery**. I. Borgia[1], B. Brunetti[1], I. Mariani[1], M. Mellini[2], A. Sgamellotti[1], C. Viti[2]. [1]*Dip. Chimica, Università di Perugia, Italy.* [2]*Dip. Scienze Terra, Università di Siena, Italy.*
Keywords: nanostructures, ceramics, metals.

Glass-metal composite materials are currently synthetized for their particular optical properties.
However, nanostructured materials akin to the modern ones were already present in the glazed pottery, for instance the one produced in Italy (Gubbio and Deruta) during Renaissance (XV-XVI century).
In particular, this glazed pottery had an outer metallic appearance, resulting from the application of lustre decoration. Lustre decoration was obtained firing metallic salts in a reducing environment.
When examined by HRTEM and AEM techniques, the luster appears to consist of a thin film, globally thinner than 5 micrometers. The film is formed by a lead silicate amorphous matrix, that hosts copper and (subordinately) silver particles, typically 10 nanometers in diameter and 2-3 nm apart one from the other. The metallic particles are definitely crystalline, as indicated by both electron diffraction and lattice imaging. The nanocrystals have shapes ranging from completely round to showing incipient crystal faces.

The textural relations between the metallic nanocrystals and the amorphous matrix are similar to what occurring in modern materials, such as the composites consisting of semiconductor nanocrystals within a dielectric matrix. Based upon this analogy, we interpretate the formation of the luster decoration as resulting from thermal treatment, aimed to control nucleation and growth. The overall optical result derives from a mixture of compositional (the Cu/Ag ratio) and textural reasons (the different thermal annealing of the initially homogeneous metallic glass).