10 Summary

Structural and electronic properties of thin Ag films on Re(10-10) have been studied as a function of surface coverage in the temperature range from 300 K to 800 K. At all coverages up to the onset of multilayer growth, the structure of the Ag overlayer depends strongly on the surface temperature. At 300 K, (1x4) islands are observed which convert slowly into (1x1) islands, as indicated by STM. Over 500 K a less compact c(2x2) phase forms for coverages below 0.8 ML. The transitions between the mentioned structures are reversible. ARUPS reveals strong electronic perturbations of the Re d-band in both the c(2x2) and the (1x4) phase. STM images provide evidence that entire Ag chains move along the [0001]-direction, offering a possible mechanism for the transition between the (1x1) and (1x4) structures. For the second Ag layer, pseudomorphic growth is observed. Addition of a third layer facilitates one-dimensional relaxation of the Ag film along the [1-210]-direction, resulting in a (1x1) LEED pattern with split spots. Ag films with a thickness exceeding 5 ML exhibit facets that appear to have (110)-orientation. TPD results in two desorption maxima corresponding to the mono- and the mulitlayer regime.

Structural properties of thin Au films on Re(10-10) have also been studied as a function of surface coverage in the temperature range from 300 K to 900 K. Ag and Au-submonolayers on Re(10-10) transform reversibly between different surface phases while maintaining constant coverages – no desorption or alloying takes place. Immediately after the deposition of Au, metastable (1x4)- and (1x5)-structures are observed at coverages of $0.2 < \Theta < 0.8$ and $0.8 < \Theta < 0.9$, respectively, which transform slowly into (1x1)-islands. For coverages between 0.5 and 0.7 ML, heating to 900 K leads to a (1x3)-superstructure that, upon cooling below 700 K re-forms the (1x4)-structure. The higher temperature required for the phase transition on Au compared to Ag, in conjunction with the fact that the structural motive of densely packed [1-210]-chains is preserved, indicates that lateral interactions between Au adatoms are significantly stronger than for Ag. In the monolayer range a (1x1)-structure is observed, in which the troughs of the Re surface are fully occupied with Au atoms. For the second Au layer a hexagonal Au film is formed, which leads to a (1x8) superstructure. Up to 10 ML the (1x8) structure is visible, even though it is superimosed by a (2x1) phase, possibly due to reconstruction of the top most layer.