15th General Conference of the Condensed Matter Division of the European Physical Society and [illegible]
Regensburg, 29.3. – 2.4.93

SF 42.60 **Sputtered neutral silver clusters up to Ag_{18}**

M. Wahl, A. Wucher and H. Oechsner
Fachbereich Physik der Universität Kaiserslautern, D-6750 Kaiserslautern

Neutral silver clusters Ag_n with $n \leq 18$ sputtered from a polycrystalline silver surface under bombardment with 5 keV Ar^+ ions were detected by means of time-of-flight mass spectroscopy. Postionization of the ejected particles was performed by an excimer laser operated with ArF ($h\upsilon = 6.4$ eV) and F_2 ($h\upsilon = 7.9$ eV). By saturating the ionization of the sputtered neutrals, relative cluster sputtering yields $Y(Ag_n)$ were determined, which exhibit a strong decrease with increasing cluster size n. In addition, the kinetic energy distribution of sputtered neutral silver atoms and multimers Ag_n with $n = 2...5$ was determined by variation of the flight time interval between the sputter pulse and ionizing laser pulse. The resulting energy distributions were compared with corresponding data taken by electron impact ionization.

SF 42.61 **Investigation and Manipulation of Phosphine Stabilized Gold Clusters with a Scanning Tunneling Microscope**

M. Herrmann, R. Koltun, G. Güntherodt, U. Kreibig*, G. Schmid+
II. Physikalisches Institut der RWTH Aachen
**I. Physikalisches Institut der RWTH Aachen*
+*Institut für Anorganische Chemie der Universität Essen*

Gold Clusters stabilized by phosphine shells were deposited from liquid solutions onto various substrates (HOPG, Si, Au, amorphous C). They were investigated by Scanning Tunneling Microscopy with the aim of tayloring particular structures. We found single clusters as well as compact layers. The identification was supported by I(U) and I(z) characteristics. We report on the translation and removal of clusters and attempts to change clusters and shells by heating.

This work has been supported by the Deutsche Forschungsgemeinschaft through SFB 341

SF 42.62 Structural Characterization of Silicide Thin Films and Their Interfaces

I. Sieber, H. Lange
Hahn-Meitner-Institut Berlin GmbH, Abt. Photovoltaik
Rudower Chaussee 5, O-1199 Berlin
S. Teichert, H. Helms
TU Chemnitz, Fachbereich Physik
Postfach 964, O-9010 Chemnitz

Structural characterization by metallographic bevelling, REM, XRD and AES has been carried out of silicide layers which have been grown by sputtering of Ni, Cr and evaporation of Fe on single crystalline silicon and subsequent in-situ or ex-situ annealing. The diffusion processes during the silicide formation lead to inhomogeneities at the interfaces. For Ni it is shown that by using template layers, i. e. thin metal layers of some Angströms thickness which are immediately transformed into silicide during deposition, these inhonogeneities at the interfaces are strongly reduced. The efficiency of template layers is discussed for $NiSi_2$ and ß-$FeSi_2$ formation.

SF 42.63 DC-Conductivity of ultrathin epitaxial films of Ag, Pb and Au on Si(111)

S. HEUN, M. KENNEDY and M. HENZLER
(Inst. f. Festkörperphysik, Uni Hannover, Appelstr. 2, D-W-3000 Hannover 1, Germany)

We will present measurements of the dc conductivity of epitaxial thin films (Ag, Pb and Au) in a thickness range from 0 to 100 monolayers. The films are deposited at 50 to 100 K in uhv on Si(111)-(7x7). The measurements of conductance, Hall effect and magnetoconductance are done in the same uhv at 20 to 200 K. Beyond a critical thickness $d_c = 2$ monolayers these films show metallic behaviour with substantial corrections due to classical (surface scattering) and quantum-mechanical effects (quantum size effect, weak localization). In films thinner than d_c there is strong evidence for Anderson localization. The percolation threshold as well as the metal-insulator transition will be discussed in detail for the silver films. Measurements like those presented here are only possible with a perfect flat substrate like Si(111). Structural informations from LEED are use for the interpretation of the measured conductivity.

SF 42.64 SPA-LEED-Studies of Growth of Ag on Si(111) 7x7 at Low Temperature

D. Thielking, E. Luo and M. Henzler
Institut für Festkörperphysik, Universität Hannover
Appelstr. 2, W-3000 Hannover 1, F. R. Germany

At temperatures of 50 - 150K silver overlayer (1 - 5ML) are grown on Si(111) 7x7 substrate. The morphology of these overlayers and their annealing behaviour is studied by SPA-LEED. Depending on deposition temperature the film is commensurate or incommensurate. From spot profile analysis one obtains detailed information about the Ag island size, orientation, distance distribution and their behaviour with deposition and annealing temperature. Furthermore we have also studied the growth of thin Ag films on Ag buffer layer which has been grown on Si(111) 7x7 at room temperature (thickness approximately 260 Å). The buffer layer shows a mosaic spread due to the steps on the Si substrate. Silver grows at low temperature in a random mode. The growth mode changes to quasi layer-by-layer growth at about 240 K. The annealing of the film grown at low temperature is comparable to deposition at higher temperatures. The gowth studies are a prerequisite for interpretation of conductivity studies of thin Ag films.

SF 42.65 Morphology of thin Au and Cu films on layered substrates controlled by evaporation conditions. A.Klein, J.Lehmann, C.Pettenkofer and W.Jaegermann (Hahn-Meitner-Institut, Abt. S1, Glienicker Straße 100, W-1000 Berlin 39, Germany)

Thin films of copper and gold were deposited onto the (0001) surface of WSe_2. The film morphology depends on sample temperature and deposition rate. Band bending and surface photovoltage were monitored by XPS, SXPS and UPS. At low deposition rates gold forms three dimensional clusters and grows in an unordered phase. Higher evaporation rates result in epitaxial growth of Au(111) layers which is evidenced by sharp valence band emissions and by a Au(111) surface state. Deposition at low temperatures gives continuous disordered films for Au and Cu. Annealing to room temperature films become discontinuos accompanied by a change to predominantely (111) orientation.

SF 42.66 STM study of the incommensurate structures of Pb on Ge(111) and Si(111) surfaces

L. SEEHOFER, G. FALKENBERG, und R.L. JOHNSON
(II. Institut für Experimentalphysik der Universität Hamburg)

The incommensurate structures formed by Pb on Ge(111) and Si(111) surfaces have been studied as a function of Pb–coverage by scanning tunneling microscopy. The systems Pb on Ge and Si represent prototype 2–D metal–semiconductor interfaces because the mutual solubility of Pb in Ge and Si is negligible. For Pb on Ge(111) a striped incommensurate phase was found for coverages greater than 4/3 monolayer. The domain walls tend to run parallel to $[11\bar{2}]$ directions and are about 66 Å wide. The distance between two domain walls is a function of coverage and reaches a minimum of 130 Å for coverages above 1.6 monolayers. Since the distance between the domain walls is a continuous function of coverage we believe that the commensurate–incommensurate phase transition of Pb/Ge(111) is continuous. The domain sizes for Pb on Si(111) are considerably smaller (20 – 50 Å). In this presentation the results for Pb on Ge(111) and for Pb on Si(111) will be compared and contrasted.

SF 42.67 STM study of a discommensurate structure of the (111) surface of Ge introduced by trace amounts of Ga.

M. Böhringer, P. Molinàs-Mata, J. Zegenhagen, Max-Planck-Institute FKF, Stuttgart

Trace amounts of Ga (<0.1 ML) deposited at room temperature on Ge(111)-c(2 × 8) [illegible] reconstruction upon annealing. The transition