MS12.01.05  
STRUCTURE ANALYSIS OF CoSi2/Si- 
/adhesive/Ge/Si(001) INTERFACES. M. Rodewald, TH Darmstadt, 
FB21, FG Strukturforschung, Petersenstr. 20, D64287 
Darmstadt, Germany

In the last decade silicide growth and silicide/silicon 
interfaces have become of interest in solid state science because 
epitaxial metal silicides are a promising material for novel 
micro-electronic devices like the metal-base and the permeable 
base transistors.

In the present investigation monocristalline (001) 
oriented films of CoSi2 have been formed on Si1-xGex/ 
Silicon(001) heterostructures with Ge-contents up to 25at.% 
by molecular beam epitaxy (1). The atomic structure of the 
CoSi2/Si-xGex interface has been investigated by high 
resolution electron microscopy (HREM) combined with image 
contrast simulations.

A domain-like structure is observed consisting of areas 
with different interface structure interconnected with steps. 
Two different atomic structure models for the different 
interface areas have been found by comparison of simulated 
and experimental images. In the first model evidence for a 
2x1 (and 1x2) interface reconstruction was found. This 
interface reconstruction is different from the already known 
interface reconstruction of CoSi2/Si(001) interfaces (2, 3). In 
the second model the Co-atom are 6fold coordinated at the 
interface and the tetrahedral coordination of the silicon atoms 
is everywhere maintained. This model is well known from 
CoSi2/Si(001) interfaces.

63(3) 298-301 (1989)
E. W., Phil. Mag. A64(2) 255-280 (1991)

MS12.01.06  
ORDERED STRUCTURES AT THE METAL 
electrodesolution INTERFACE. C. A. Lucas, N. M. 
Markovic and P. N. Ross. Materials Sciences Division, Lawrence 
Berkeley National Laboratory, University of California, Berkeley, 
CA 94720

Unraveling the atomic structure at the metal-electrode/solution 
interface presents a great challenge to the experimentalist due to its 
inhertly complex nature. X-ray diffraction is an ideal tool for 
studying this structure and the related surface electrochemical 
phenomena, as the penetrating nature of x-ray radiation allows in-
situ study of the metal surface. In contrast to studies of adsorbate 
systems in ultrahigh-vacuum, adsorbate structures at the electrode 
surface are complicated by the range of possible adsorbing species 
in solution. We have performed a series of experiments with Pt(hkl) 
electrodes to determine the role of anion adsorption in surface 
reconstruction, surface relaxation and during the underpotential 
deposition (UPD) of metals. Information is obtained via measurement 
of the in-plane diffraction satellites due to ordered 2D adlayers and 
by measurement of the the 'crystal truncation rods' (CTR's) to relate 
the positions of the surface atoms with respect to the bulk Pt lattice.

Monitoring the scattered intensity at selected reciprocal lattice points 
as a function of the electrode potential is key to understanding 
the sequence of adsorbed structures. Interpretation of the x-ray results 
is aided by the use of anomalous scattering methods to obtain 
chemical sensitivity in deriving structural models.

This work was supported by the Director, Office of Energy Research, 
Office of Basic Energy Science, Materials Sciences Division (MSD) 
of the U.S. Department of Energy (DOE) under Contract No. DE-
AC03-76SF00598.

MS12.01.07  
SCALING OF SUBMONOLAYER Cu ISLANDS 
grown on Cu(110). D.A. Walco, K.L. Whiteaker, and L.K. 
Robinson, University of Illinois, Urbana, IL 61801

The structure and properties of a thin film are often determined 
by the growth conditions as the first monolayer is deposited. We 
have studied the influence of an anisotropic substrate on the 
nucleation, growth, and coalescence of homoepitaxial islands. 
Surface x-ray diffraction was used in situ to study submonolayer 
deposition of Cu on Cu(110). After deposition, we found diffuse 
scattering near the out-of-phase condition featuring an elliptical ring, 
which is due to the anisotropic island morphologies. The major 
and minor axes of the ellipse are proportional to the island densities 
or inversely proportional to the island spacing in the in-plane [101] 
and [110] directions respectively. The density of islands in each 
of these directions scales with deposition rate and with substrate 
temperature. However, the scaling results are not well-described 
by mean-field rate equation formulations which fail to account for 
the full complexity of the fcc(110) surface. Evidence for a transition 
from one to two-dimensional island growth is seen at T ~ 208 K.

PS12.01.08  
3-D STRUCTURAL ANALYSIS OF AG/Si(111) 
INTERFACES BY X-RAY DIFFRACTION. R. D. Aburano, 
Hawoong Hong, J. M. Roesler, K.-S. Chung, H. Chen and T.-C. 
Chiang, University of Illinois, and P. Zschack, ORISE.

The interface of the "prototypical nonreactive" Ag/Si(111) 
system exhibits different structures depending upon the interfacial 
preparation. Room temperature deposition of a Ag film on a clean 
Si(111)-(7x7) surface results in an Ag-modified (7x7) structure at the 
interface. This structure transforms to a bulk-like (1x1) structure when 
annealed above 200°C. This temperature is characteristic for the 
formation of the (orbed on Si(111), This (3x3)R30°-Ag reconstruction 
is also not retained at the interface even when it is buried under a 
room temperature deposited Ag film. Crystal truncation rod analysis 
of the Ag-modified (7x7) and (1x1) structures revealed the 
preservation of the Si stacking fault in the former and a Ag-Si mixed 
layer at the interface in the latter. These results may provide some 
insight into the observed Shottky barrier height difference for these 
two interfaces.

PS12.01.09  
ANALYSIS OF IN-PLANE STRUCTURES OF 
THE As-DEPOSITED Si SURFACES USING GRAZING-
ANGLE X-RAY STANDING WAVES. O. Sakata, S. Kumanono, N. 
Eng. Mater., Tokyo Institute of Technology, Nagatsuta, Midori, 
Yokohama 226, Japan

We applied grazing-angle X-ray standing waves to a Si(111):As 
ex11 surface to determine the in-plane position and order of As atoms 
under UHV condition (Sakata & Hashizume (1995)). As K emission 
profiles showed As atoms located in the threefold coordinated sites 
of the bulklike Si(111) surface with little disorder. The displacement 
is smaller than 2% of the d spacing of the (2 20) planes and the 
coherent fraction is higher than 80%. This technique has now been 

deployed to the Si(100):As surface. The substrate Si surface was cut 
off the (100) plane to favor the 2x1 structure over the 1x2 structure. 
The As emission data collected in the vicinities of the 022 and 0 2 
Bragg peaks under UHV condition at the Photon Factory 
synchrotron source were fit to a model including parameters for the 
area ratio of the 2x1 and 1x2 domains (M2, M1) and the normalized 
As-As dimer bondlength (2f). The fits determined η parameters 
defined by η=Mi+Mj·cos(2θf) (i, j = 1, 2). Solving the equations 
using the values of η=0.42 and η=0.066 obtained from the fit under 
the assumption l=0.664, corresponding to 2.55 Å, gave M1=0.38 and 
M2=0.62. This indicates a highly ordered surface with no As atoms 
in random positions.