14.2–5

Interaction entre l'oxygène et le chrome

Etude par LEED AES et EELS d'un monocristal

et d'un acier inoxydable Fe-Cr-Ni

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L'élément chrome à la surface d'un monocristal ou comme élément constituant d'un alliage en surface d'un acier inoxydable a un comportement très différent vis-à-vis de l'oxygène suivant la température à laquelle l'interaction a lieu.

Nous avons mis en évidence deux types de liaisons caractérisées par une étude en AES et en EELS.

L'interprétation du signal Auger de l'oxygène et des diagrammes obtenus en diffraction des électrons de faible énergie (LEED) montre l'évolution de la surface de la face (110) d'un cristal de chrome.

On obtient finalement une épitaxie de l'oxyde Cr_2O_3 sur cette face. Cr_2O_3 (0001) // Cr (110).

Dans le cas de l'acier inoxydable, on observe une oxydation préférentielle du chrome par rapport aux autres métaux formant l'alliage.

14.2–6 LEED AND RHEED INVESTIGATION OF THE INITIAL GROWTH OF COPPER AND LEAD ON GOLD AND SILVER SINGLE CRYSTAL SURFACES: By M.S. Zei, Y. Nakai, D.M. Kolb and G. Lehmpfuhl. Fritz-Haber-Institut der MPG, Faradayweg 4-6, D-1000 Berlin 33, Germany.

The structure of Cu and Pb deposited at room temperature onto Au and Ag single crystal surfaces was investigated by LEED and RHEED. Differences in the structures were found between electrochemical deposition and evaporation in ultrahigh vacuum (UHV). E.g., the electrochemically deposited 1/2 monolayer of Cu on Au(111) showed a $(\sqrt{3}x\sqrt{3})$R30 superstructure while the evaporated Cu adlayer was pseudomorphic, leading to a (1x1) structure. The different growth behaviour of Cu was tentatively explained by differences in the bare Au(111) surfaces: in UHV Au(111) shows a reconstructed (23x1) surface, which does not exist in the electrolyte. Cu deposited onto Ag(111) showed island growth from the very beginning. The islands can only be detected by RHEED, but not by LEED. Pb evaporated on Ag(111) gives rise to the $(\sqrt{3}x\sqrt{3})$R30 superstructure as already described by various authors. A comparison with electrochemically deposited Pb on Ag(111), however, is disturbed by the oxidation of Pb during the transfer to the UHV diffraction chamber.

14.2–7 OBSERVATION OF SURFACE MICRO-STRUCTURES BY MICRO-PROBE RHEED TECHNIQUE. By M. Ichikawa, T. Doi, M. Ichihashi and K. Hayakawa, Central Research Laboratory, Hitachi Ltd., Kokubunji, Tokyo 185, Japan.

Micro-structures (atomic steps, dislocations, etc.) on surfaces have great influence on surface properties, e.g. diffusion phenomena, segregation and crystal growth kinetics.

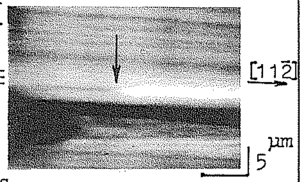
Surface micro-structures have been observed using ultra-high vacuum electron microscope (Osakabe et al., Surf. Sci. 102 (1981) 424), scanning tunneling microscope (Binnig et al., Phys. Rev. Lett. 49 (1982) 57), etc.. For observing these and doing micro-area analyses, we have developed a micro-probe reflection high-energy electron diffraction (RHEED) technique with high spatial resolution and high detection sensitivity. A dark field imaging method using a part of the diffraction spot has made it possible to take image contrasts of dislocations and atomic steps caused by crystallographic orientation changes on the order of 0.1 mrad.

A dark field image using the 444 spot of a clean Si(111) surface is shown in Fig.1. The dark/bright pair contrast in the image is produced by a screw dislocation. Some of the steps running in the [11$\bar{2}$] direction (indicated by the solid lines) are considered to be atomic steps, since one of the steps meets the dislocation and the contrast is weaker than that of the dislocation.

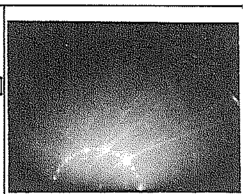
When gold 6 Å thick was deposited on the Si(111) surface at room temperature and the sample heated at about 1000 °C-10 sec, 5x1 Au structures were produced on the surface, as shown in Figs.2(b) and (c). In the dark field image using the 444 spot (Fig.2(a)), certain dark contrasts in addition to the surface steps are observed. The RHEED pattern from these dark areas shows that the 5x1 Au structure having 5 times the period in the [0$\bar{1}$1] direction was produced here. The RHEED pattern from the bright contrast areas shows that the 5x1 Au structure having 5 times the period in the [$\bar{1}$10] direction was produced. The bright contrast area is larger than the dark contrast area. This indicates that production of the 5x1 Au structure was strongly affected by surface steps running in the [11$\bar{2}$] direction which break the three-fold symmetry of the Si(111) surface.

These results indicate the usefulness of the micro-probe RHEED technique both for observing surface micro-structures and for studying crystal growth on substrates within mono-layer depth resolution.

Fig.1



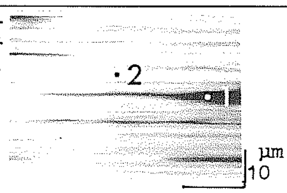
Arrow points a screw dislocation. 0.5 μm



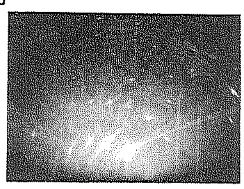
(b) Dark area, 1

Fig.2

[11$\bar{2}$]



(a) 1 μm



(c) Bright area, 2