

PS-11.01.31 SURFACE POTENTIAL STUDY OF MONOLAYERS OF SURFACTANT DONOR AND ACCEPTOR MOLECULES. By F. Rustichelli¹, S. Dante¹, P. Mariani¹, I.V. Myagkov², V.I. Troitsky²

¹Istituto di Scienze Fisiche, Università di Ancona, via Ranieri, 60131 Ancona, Italy

²Research Institute of Physical Problems, 103460 Moscow, Russia

Charge-transfer complexes and salts on the basis of surfactant donor and acceptor molecules are widely used for the preparation of thin conducting Langmuir-Blodgett (LB) films. Field effect is discovered in the conducting LB films, which provides the opportunity for device operation. Another promising possibility is the deposition of polar structures with the alternation of donor and acceptor monolayers possessing pyroelectric properties. Such films can be used for the development of molecular electronic devices. However, the improvement of quality of film deposition, the increase of conductivity values, as well as the search for new perspective materials are necessary for real applications, so that a careful investigation of the monolayers used for LB film preparations is required. In this work, monolayers of different donor and acceptor compounds were studied by surface potential technique. The investigated donor and acceptor molecules are:

hexadecylbis-(ethylenedithio)-tetrathiafulvalene (C16-BEDT-TTF), heptadecyl-dimethyl-tetrathiafulvalene (C17-DMTTF), hexadecylethylenedithio-propylenedithio-tetrathiafulvalene (C16-EDT-PDT-TTF), hexadecyltetracyanoquinodimethane (C16-TCNQ), octadecyl-tetracyanoquinodimethane (C18-TCNQ), heptadecyl-oxycarbonyl-tetracyano-anthraquinodimethane (C17-OC-TCNAQ) and octadecyl-aminosulphonyl-tetracyano-anthraquinodimethane (C18-AS-TCNAQ).

Mixed donor acceptor monolayers were also investigated. In particular, surface potential data in connection with surface pressure-area isotherms, give the possibility to determine the charge of the monolayer in dependence on composition and pH of the water subphase, as well as the projection of the dipole moment of the hydrophilic group along the normal to the layer plane. Moreover, information on the molecular

PS-11.01.32 X-RAY AND NEUTRON REFLECTIVITY STUDIES OF TWIST GRAIN BOUNDARIES AND PHASE BOUNDARIES. By E. Burkel, Sektion Physik, University of Munich, Munich, Germany and M. R. Fitzsimmons, LANL, Los Alamos National Laboratory, Los Alamos, USA

Artificial grain boundaries or phase boundaries in bicrystals are buried interfaces which are well suited for studies with the techniques of X-ray and neutron reflectivity.

The measurements of the specular and non-specular reflectivity of Au and Ni bicrystal specimen indicate that the grain boundaries are rough. The roughness of the grain boundary depends on the geometrical orientation of the single crystal substrate.

The observed diffuse scattering originates from the grain boundary. This is confirmed by *in situ* studies of the growth and destruction of the grain boundary. The experiments suggest that X-ray reflectivity is well suited to continuously monitor the formation of a grain boundary.

Furtheron, the reflectivity results obtained from a thin Fe film on a MgO substrate will be discussed as an example of a phase boundary.

PS-11.01.33 INTERFACE AND SURFACE OF NANOCRYSTALLINE TIN OXIDE. By Wang Dazhi, Wen Shulin, Chen Jun, Xu Shoumin*, and Yu Wenhui, Department of Materials Science and Engineering, University of Science and Technology of China, The State Key Lab of High Performance Ceramics and Superfine Microstructure of China, Hefei, Anhui 230026, China.

The nanocrystalline tin oxides produced by sol-gel method were studied by the scanning, the transmission, and the high resolution electron microscopy, and by the x-ray diffraction method. Results of these studies suggest that the micro-structure of this material is different from that of the nanocrystalline Fe[R. Birringer, H. Gleiter, H.P. Klein, and P. Marguardt, Phys. Lett 102A, 365 (1984)]. A vast number of nanometre voids lead to the presence of a high-density surface structure in the material. The total area of the surfaces is larger than those in the nanocrystalline Fe. Though there exist interfaces between the grains in the nanocrystalline tin oxides, they are less important than the surfaces. The latter greatly affect the structures, characteristics and properties of the material. The experimental results can all be self-consistently explained within this point of view.

The Project Supported by National Natural Science Foundation of China.

PS-11.01.34 AN HIGH-RESOLUTION ELECTRON MICROSCOPIC STUDY OF THE INTERFACE BETWEEN DIAMOND FILM AND ITS SUBSTRATE, By N. Jiang^{1,2*}, Z. Zhang¹, B. W. Sun³ and D. Shi¹, ¹Beijing Laboratory of electron Microscopy, Chinese Academy of Sciences, P. O. Box 2724, 100080 Beijing, P. R. China; ²Dalian University of Science and Technology, Dalian, P. R. China; ³Institute of Physics, Chinese Academy of Sciences, 100080 Beijing, P. R. China

An high resolution electron microscopic (HREM) study of the interface structure between the diamond film and its silicon substrate has been carried out. The polycrystalline diamond film has been grown on the (111) plane of Si single-crystal substrate by the hot filament chemical vapor deposition (HF-CVD) method. Hydrogen mixed with 1 % methane was used and the film growing time was 5 hours. The diamond film was cleaned by ultrasonic wave and the cross-sectional specimens were cut along (112) planes of the Si substrate. Thin specimen for HREM studies were prepared by mechanical thinning and subsequent ion-milling. HREM observation were carried out by using a JEOL-2010 electron microscope with a point resolution of 0.19 nm. The HREM images reveal that there is an amorphous layer between diamond film and its substrate for a sample grown by HF-CVD. β -SiC crystallites are embedded in this amorphous layer. The HREM images of cross-sectional specimens reveal that the diamond crystallites can nucleate directly on either the intermediate amorphous layer, the β -SiC crystallites or at some scratches of the Si substrate.