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THIN FILM GROWTH

B-THU-06

SURFACE STRUCTURE OF POLYMER GELS AND EMERGING FUNCTIONS, Y. KOBIKI and A. SUZUKI (Dept. of Materials Science, Yokohama National Univ., Yokohama 240-8501, Japan)

In this paper, we report the surface structure of polymer gels in submicrometer scale. The gels were synthesized in disklike shapes, and one of the surfaces is chemically adhered on a glass plate. The mesoscopic spongelike domains were directly observed in water by an atomic force microscopy (AFM). The surface roughness was found to be strongly affected by the inhomogeneity of polymer networks and by the bulk volume phase transition in response to the external stimuli. The surface structure characterized by the domains was discussed in terms of the auto-correlation function and the root-mean-square roughness, which were calculated from the AFM images. In order to demonstrate the relation between the surface structure and its emerging function, we have measured the static contact angle of the sessile air bubbles in water on the surfaces of thermoresponsive poly (*N*-isopropylacrylamide) gels. The temperature dependence of the contact angle was measured on two samples with different bulk network structures; the homogeneous and the phase separated gels. It was found that the temperature dependence as well as the absolute value of the static contact angle are quite different between them. These results were qualitatively discussed in terms not only of the chemical but also of the physical surface properties; the former is the balance of the hydrophobic-hydrophilic interaction in this system, and the latter includes the surface polymer density, the surface roughness, and the network inhomogeneity.

B-THU-07

STRAIN INDUCED RECONSTRUCTION NEAR MONATOMIC STEPS ON SI(001), J.-Y. KOO, C. HWANG, D.-H. KIM, G. LEE, S. LEE (Korea Research Institute of Standards and Science, P.O.Box 102, Yusong, Taejon 305-600, Korea), J.-Y. YI (Dong-A Univ., Hadan-Dong, Saha-Gu, Pusan 604-714, Korea), D.-H. SHIN (Dongguk Univ., Chung-Gu, Pildong 3-26, seoul 100-715, Korea)

The atomic structure of the monatomic steps on Si(001) is investigated employing scanning tunneling microscopy. On the upper terrace of the SB step the existence of kinks induces a local p(2x2) structure with the direction to the center of the step. The structure of the SB step is correlated to that of the SA step through the kinks and is determined by the boundary conditions imposed by the SA step. The atomic structure of the steps is also correlated with the zigzag buckling along the dimer row of the lower terrace through the subsurface interaction. The formation of various structures observed near the steps is explained by the simple geometrical rule based on the bonding characteristics.

B-THU-08

THIN FILM GROWTH OF OXIDE SUPERCONDUCTOR ON PIEZOEECTRIC SUBSTATE, M. AKINAGA (Dept. of Phys. Fukuoka Univ. Education, Munakata, Fukuoka 811-4192, Japan), S. SUZUKI (Dept. of Geology, Fukuoka Univ. Education, Munakata, Fukuoka 811-4192, Japan) and L. RINDERER (Insti. of Exper. Phys. Univ. Lausanne, CH-1015 Lausanne-Dorigny, Switzerland)

The piezoelectric $PbTiO_3$ films were prepared on MgO in situ by rf-sputtering. Then we have prepared c-axis oriented superconducting Bi-2212 films on $PbTiO_3$/MgO and prepared $YBa_2Cu_3O_{7-d}$ and $CaLaBaCu_3Oy$ films on $LiNbO_3$, YSZ/$LiNbO_3$ and YSZ/$LiTaO_3$ with or without Ag-addition by sputtering. The sample surfaces were analyzed by X-ray diffraction (XRD), energy dispersive X-ray spectroscopy (EDS) and scanning electron microscope (SEM). The relations between their electrical transport properties and morphology of sample surface or c-axis orientation rate of prepared $PbTiO_3$ fims were investigated. Surface acoustic waves (SAW) propagated on the superconducting film/$PbTiO_3$ or $LiNbTiO_3$. It has been found that the transition temperature does not depend on the c-axis orientation rate of $PbTiO_3$ but absolute value and temperature coefficient of the resistivity in the normal state strongly depends on the rate. The temperature dependence of the SAW attenuation coefficient did not show any gap structure at the superconducting transition temperature and a large attenuation peak at about 230K reported often in bulk samples has been reconfirmed.

B-THU-09

AB INITIO STUDY OF Ge ADATOM ADSORPTION, DIFFUSION, AND EXCHANGE ON SURFACTANT COVERED Si(111) SURFACES, YOUNG-IO KO*, K. J. CHANG (Dept. of Physics, KAIST, Taejon 305-701, Korea), and JAE-YEL YI (Dept. of Physics, Dong-A Univ., Pusan 602-714, Korea)

We study the effects of various surfactants on Ge adatom adsorption, diffusion, and exchange on Si(111) surfaces through first-principles pseudopotential total-energy calculations. The surfactant-covered surfaces include Si(111):Ga-1 × 1, Si(111):As-1 × 1, and Si(111):Sb-($\sqrt{3} \times \sqrt{3}$) R30° surfaces. For a single Ge adatom, the adsorption sites that substitute for surfactant atoms are found to be most stable for all the surfactant-covered surfaces considered. Ge adatoms interact strongly with the Ga layer and thereby the surface diffusion barriers are substantially enhanced on the Ga-terminated surface. In contrast, Ge interactions with both the As and Sb layers are found to be relatively weak, while adatom exchange processes on these surfaces are found to be highly efficient, leading to a severe suppression of Ge adatom diffusion over the surface.

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THURSDAY