THURSDAY

Sym. H : The Surface, Interface & Nano-structure of Materials

THIN FILM GROWTH

B-THU-10

Distribution of S in $(NH_4)_2S_x$ treated GaAs surface, J. W. Kim, M. G. Kang and H. H. Park (Dept. of Ceramic Eng., Yonsei Univ., 134 Sinchon-dong, Seodaemun-ku, Seoul 120-749, Korea)

The structural distribution, surface composition and bonding states of HCl- and $(NH_4)_2S_x$-treated GaAs surfaces were investigated using angle-resolved X-ray photoelectron spectroscopy and low energy electron diffraction (LEED). The passivated GaAs surface by $(NH_4)_2S_x$ solution showed a formation of As-S bond. Compared with HCl-treatment, more rugged oscillation of photoelectron intensities of Ga and As was observed with the $(NH_4)_2S_x$-treated GaAs surface according to the polar angle of GaAs surface. Through LEED analysis, the passivated GaAs surface showed a (2×1)-reconstructed structure with regular distribution of As-S bonds. After *in-situ* annealing under ultra high vacuum condition, bond exchange from As-S to Ga-S occurred. After annealing, S also showed rugged oscillation of photoelectron intensity according to the polar angle of GaAs. This could be explained by the anion exchange reaction of S with As in regular lattice site or by the occupation of As vacancy to a depth of three atomic layers during annealing.

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SURFACE MAGNETISM

B-THU-11

THE ENHANCEMENT OF KERR EFFECT IN THE Co/Ag GRANULAR FILM STRUCTURE NEAR THE PLASMA EDGE, L. Y. Chen, S. Y. Wang, W. M. Zheng, R. J. Zhang D. L. Qian, Y.X. Zheng, Y. M Yang And B. Y. Li(Departments of physics and Material Science, Fudan University, Shanghai, 200433. China)

The magneto-optical properties of Co-Ag granular films were investigated by SEM, X-ray, ellipsometry and polar Kerr magneto-optical spectrometer in this work. It was found that both the Kerr rotation and the ellipticity increase with increasing Co content. The Co-Ag granular films with different Co composition were annealed for an hour at 100, 250, 400, 500℃, respectively. The Kerr parameters increase rapidly after sample annealing at 100 ℃, and reach the maximum value at 250℃ with a strong resonant enhancement peak appeared at the 3.95 eV photon energy corresponding to the plasma edge of Ag where the onset of interband transition is occurred. At the position, the Kerr effect is greatly enhanced as compared to the value of as-deposited films. The effect is analysed and will be useful for the application of short wavelength magneto-optical recording.

B-THU-12

NANOPHASE FORMATION IN CESIUM ION IMPLANTED ZIRCONOLITE AND ZIRCONIA, L.M. WANG AND R.C. EWING (Department of Nuclear Engineering and Radiological Sciences, The University of Michigan, Ann Arbor, MI 48109, USA)

Zirconolite ($CaZrTi_2O_7$) and zirconia (ZrO_2) are important potential nuclear waste forms. In this study, the effects of Cs ion implantation in zirconolite and yittria stabilized zirconia (9.5 at. % YO_2) have been investigated in order to develop a basic understanding of the distribution and solubility of fission products, as well as radiation effects in these phases. Implantation of 70 keV Cs^+ ions was conducted with *in situ* transmission electron microscopy (TEM). After implantation at room temperature to 5×10^{16} ions/cm^2, small precipitates (~5 nm in diameter) were observed in amorphized zirconolite. The size of the precipitates grew to 20-30 nm during subsequent annealing and continued implantation at 450 °C to a fluence of 1×10^{17} ions/cm^2, which corresponds to over 20 at. % Cs and over 300 displacement per atom (dpa) in the implanted region. Analytical TEM (AEM) has confirmed that these nano-scaled precipitates contains substantial amounts of Cs. The yittria stabilized zirconia was implanted at 200 °C. A high density of defect clusters of the nano-meter scale developed after 2×10^{16} ions/cm^2, however, the sample remained crystalline with the cubic structure even after 1×10^{17} ions/cm^2. The defect clusters with the characteristics of interstitial type dislocation loops were stable during the subsequent annealing at 500 °C, and the excess Cs atoms may be confined in these nano-scaled defect clusters.

B-THU-13

MAGNETIC STRUCTURE OF FE OVERLAYER ON RH(001) SURFACE, C. **Hwang***(Materials Evaluation Center, KRISS, Daejon, Korea)

The magnetic phase of thin Fe overlayers on top of a Rh(001) surface has been probed using the Surface Magneto-optical Kerr effect(SMOKE). The suppression of the ferromagnetic order up to six atomic layers of Fe has been observed. This suppression of the ferromagnetic order is attributed to the fct structure which has been predicted to favor antiferromagnetic ordering. Simple misfit strain argument is enough to predict the phase of the magnetic phase of the Fe overlayers on various (001) substrates. This can also explain the invar problem which has been still controversal. As the thickness of films increases, this overlayer structure undergoes another magnetic phase transition at the thickness of 12ML. This is due to the fully relaxed formation of the bulk-stable bcc phase, where the strain field has been degraded due to the defect or charge realignment. The bi-quadratic spin alignment which has been observed in this system is quite unusual in this connected overall layers. The out-of-plane spin alignment in 7-12ML has been preserved while the in-plane spin is built up for thicker layers larger than 12ML. The possible origin has been probed in electronic terms using spin and angle resolved photoemission spectroscopy.

* Part of the work has been collaborated with A. Swan at ORNL, S. Kim at KAIST and J.S. Kang at CUK .