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operating speed due to the noise and cross-talk by stray capacitance. A new material with a low dielectric constant (2.0), a strong adhesion and a thermal stability (> 4000C), is required to solve these problems. Fluorinated amorphous carbon (FAC) is proposed for this. This thin film has an amorphous C-C cross-linked structure and has the same C-F bonds found in PTFE. The strong C-F bonds decrease the dielectric constant, and the C-C cross-linked structure maintains the film's thermal stability. Recently, a research on FAC (a-C:F) thin films with dielectric constant 2.1 ~ 2.3 have been started. Some problems of the films were reported such as low adhesion and thermal stability. Fluorinated amorphous carbon was deposited from CF_4, C_2F_6, C_4F_8 and CH_4 gas mixture under the change of C/F concentration ratio by large-area high-density plasma CVD method, and being characterized.

The ICP reactor has attractive features for film deposition because of its high-density plasma production compared with other conventional types of plasma sources. Moreover, it is advantageous for dissociation source gases because high-energy electrons exist in the plasma source region and these dissociated species can be expanded uniformly over large diameters by controlling the magnetic field at the position of processing chamber. Thus, the ICP source combined with a reaction chamber has provided a new method for better high-density plasma chemical vapor deposition (HDP-CVD).

In this work, a ICP has been utilized for a-C:F film deposition using CF_4, C_2F_6, C_4F_8 and CH_4 gas mixture. The plasma density and the electron temperature are measured using a Langmuir probe. Discharge conditions such as gas composition, sheath potential, and the relative densities of the radicals affect the properties of the film. Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS) show that the film has Si-F, C-C, and C-F bonds. The Si-F bond at a-C:F/Si interface and C-F bonds may lower the dielectric constant greatly.

14. Application of Filtered Pulsed Vacuum Arc Plasma to Deposited AlN and Al_2O_3 Thin Films

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Since the advent of plasma immersion ion implantation (PIII), it has been widely applied to enhance the surface properties of materials. In the past several years, extensive progress has been made in understanding the improvement of the mechanical properties of the treated materials, but there are few reports on the synthesis of functional materials by this technique. Aluminum nitride (AlN) and aluminum oxide (Al_2O_3) thin films are potential candidates in optoelectronic and microelectronic applications because of their excellent properties such as high temperature chemical stability, high electrical isolation, and thermal conductivity. Due to their high hardness, they can also be employed as protective and passivating coatings. In this study, we report our recent work using metal PIII to synthesize AlN and Al_2O_3 thin films. AlN and Al_2O_3 thin films are deposited on Si(100) substrates by using filtered pulsed vacuum arc plasma of aluminum in the atmosphere of pure nitrogen or oxygen gas. The fabricated thin films are characterized by transmission electron microscopy, scanning electron microscopy and glancing angle x-ray diffraction to reveal their crystalline quality, morphology, and grain size. The chemical composition and bonding characteristics of the thin films are determined using Rutherford backscattering spectrometry, x-ray photoelectron spectroscopy, and Fourier

transform infrared spectroscopy. The film properties, such as adhesion strength to the substrate, hardness, transmittance, refraction index, are also evaluated.

15. Pulsed Laser Deposition of ZnSe:N Epilayers Assisted by Active Atomic Nitrogen Beams

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We have grown nitrogen doped ZnSe epilayer on GaAs(100) substrates by pulsed laser deposition (PLAD) assisted by an nitrogen beam produced by an arc-heated beam source. Atomic force microscopy (AFM) shows that the surface of an ZnSe epilayer grown on GaAs(100) at 10^{-3} torr is flat and dense and its roughness is about 1.6 nm, less than that of some good quality MOVPE-grown samples. X-ray diffraction (XRD) results show that this ZnSe epilayer are of a fine characteritics of single crystallinity. X-ray photoelectron spectroscopy (XPS) indicates that the epilayers are composed of 84% Zn and Se, 10% N and 6% O, and other kind of impurity are scarcely in existence. XPS spectra involving $Zn(2p_{3/2})$ and N(1s) core level indicates that doped nitrogen with an estimated concentration of over 10^{21} /cm^3 exist in the as-grown epilayer.

Session 4

16. A Study on Diamond-like Carbon Films for Medical Applications

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Diamond-like carbon (DLC) film is the excellent candidate for medical applications due to its desirable properties such as high hardness, low coefficient of friction, and chemical inertness. The tribological behavior and biocompatibility of DLC films deposited on both CP Ti and ELI Ti-6Al-4V have been studied and compared with those of TiC_xN_y. A hybrid deposition system composed of DC magnetron sputtering and 13.56 MHz RF PACVD was used to deposit the intermediate Si layer and DLC films. Si buffer layer, thickness of 100nm, was deposited by DC magnetron sputtering in Ar, and DLC film was deposited by C_6H_6 glow discharge to the thickness of 1μ. Cathodic arc deposition was employed to deposit TiC_xN_y. The tribological behaviors of DLC and TiC_xN_y films were evaluated both in atmospheric and in wet environments with a pin-on disk type wear tester.

17. Highly Adhesive Calcium Phosphate Layer on UHMWPE Prepared by IBAD

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