INTERNATIONAL CONFERENCE ON
METALLURGICAL COATINGS
AND THIN FILMS

PROGRAM AND ABSTRACTS

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Advanced Surface Engineering Division
of AVS
contribution to the overall phase composition after plasma spraying. With this information the NMD maps, from which relative decomposition values previously presented were more carefully scrutinized by the aid of an axial quadrupole (AQG) and Raman analysis. The analysis was carried out for two sets of as-sprayed powders (plate power and suspension precipitation variation) is fully quantified the phases (including amorphous phase) present after plasma spraying. Raman analysis was also utilized to determine structural changes to the HA lattice after the spray process. The refinement of lattice parameters of HA in the as-sprayed powders indicated a large decrease in both a/c-axes corresponding to 15/20% plate power for both the concentration of feedstock suspension. The amorphous content thus calculated was plotted against re-crystallisation peak areas obtained from DSC. The calculated amorphous content correlated well with the DSC peak areas giving a linear fit with R2 value of 0.91. The correlation enabled the calculation of the heat of reaction (55.88kJ/mol) for the crystallisation of the amorphous CaO into HA. The compounds consolidated from the size-free HA powders by spark plasma sintering exhibited Young's Modulus and hardness of around 10GPa and 500 HV, respectively, and fracture toughness (~1.2MPa.m0.5) 1.5 times the values published in the literature for the finest HA. In-vivo results indicated that the compacts were highly bioactive revealing a re-precipitated layer of hydroxy-carbonate-sparite up to one week after immersion.

2:50pm GT4/SA-2.3 Nitriding of Titanium Discs and Induction-Dried Dental Implants using Hollow Cathode Discharge, C. Alves Jr., Universidade Federal do Rio Grande do Norte, Brazil, C.B. Carvalho Neto, C.C.G. Monteiro, C.P. da Silva, V. Machado, LafPlanta - Departamento de Fisica Teorica e Experimental - UFRN, Brazil
Hollow Cathode Discharge (HCD) was used in this work and the best temperature and pressure sintering conditions, leading to higher surface contact area and an increased wetting of the surface of titanium discs samples and industrial dental implants, were searched. These surface properties were very important factors accelerating the osseointegration process. Samples were sintered at pressures ranging from 1.5 to 2.5 bar, temperatures ranging from 400 to 700°C, and sintering times between 1 and 2hrs. The samples were characterized by optical and electron microscopy and by X-ray diffraction. It has been observed that for temperatures above 500°C, the samples presented dark coloration and non-reflective layers. Furthermore, these layers proved to be easily detached using ultrasonic cleaning procedures. In contrary the best sintered layer stability, increased surface roughness and better wetting has been observed for samples sintered at 200°C. To improve these conditions were used to minute chosen industrially fabricated dental implants. Our results show increased surface roughness and superior wetting characteristics.

2:50pm GT4/SA-2.4 Investigation of Adhesion Between a Dielectric Layer and a Parylene Overcoat using a CV Measurement Technique, V.V. Chait, T.H. Wu, J.M. Tseng, National Cheng Kung University, Taiwan, ROC
In recent years, the state-of-the-art molecular imprinting polymer (MIP) based sensor technology has received numerous attentions due to its high selectivity and high efficiency. This type of sensor uses cold effect transition (FET) as the sensing mechanism. The MIP layer is deposited on top of the gate material u immobilize the species that is to be detected. For successful sensing to occur, the adhesion between the MIP and the gate material is of great importance. In addition, the structure of MIP-based sensor cells for the use of polymer electrolyte with a cavity for the exposure of the MIP and to have the liquid electrolyte. The polymer electrolyte is in place over the contact with the gate material. The adhesion between them is also crucial to the integrity of the MIP-based sensor. As a result, we have investigated the adhesion between selected polymers, including both MEPS and encapsulation polymers, and different gate materials, including SiO2, Si3N4, and TaN. In addition to conventional scratch test for the evaluation of adhesion, we have a use CV measurement technique to examine the adhesion in the presence of liquid electrolyte. Miniaturization of interface between polymer and gate materials was also examined using scanning electron microscopy.

2:50pm GT4/SA-2.5 Structure and Properties of Ammoniated Amorphous Hydrogenated Carbon (a-C:H) Films for Biomedical Applications, P. Kung, Y. Li, K. Hong, Y. Fong, G. Wang, Yu, Y. Zeng, and J. Huang, Virginia Commonwealth University, Richmond, VA, USA, and Southwest Jiaotong University, PR China, J. Wang, City University of Hong Kong, K. Hong, Virginia Commonwealth University, Richmond, PR China, P.K. Chu, City University of Hong Kong
When a biomaterial comes in contact with a biological body, biological substance denaturation will be concomitantly with the physical interaction between the biomaterial surface and biological substance, such as blood protein denaturation resulting from electrical charge transfer. In this study, we focus on the relationship between the physical properties of amorphous hydrogenated carbon (a-C:H) and its blood compatibility. The films were fabricated using plasma immersion ion implantation (PIII,H,2)+, %bylowed by sputtering in vacuum between 200-600°C. A series of a-C:H films with different structures and chemical bonds was characterized by Raman, XPS, AES and APM. The blood compatibility of the films was evaluated employing in vitro platelet adhesion. The adhesion, activation, and morphology of the platelets were investigated using scanning electron microscopy (SEM). The physical properties and surface characteristics of the films were also examined, including the carrier content in films, a-C:H:H ratio, film thickness, oxygen content, and any resulting biological compatibility of a-C:H films.

New Electrocrystals in Coatings and Thin Films
Room: San Diego - Session H2-2

New Materials and Integration Strategies for Future Microdevices
Moderator: A.A. Iliadis, University of Maryland
1:30pm H2-2.1 High Quality R.F. Sputtered Metal Oxide (Ta, Hu) and their Properties after Annealing, H. Grewe, C. Kunath, E. Kühn, F. Körner, D. Hafner, B.K. Meyer, G. Teichert, Radnitz et Haase, Conducta, Germany
Transition metal oxides are often used as surface coating, dielectric material and for sensor applications due to their electrical, mechanical and optical properties. The chemical inertness and mechanically resisting along with suitable deposition possibilities leads to wide spread applications. The material properties are known to be depended on the deposition process and the postannealing of the deposited layer. Ta, Hf and Ta-N oxide layers have been deposited by rf, spanning of high purity targets (99.997 % and higher) on 150 mm silicon wafers. Typical flow thicknesses were 100 to 150 nm. The deposition process parameters for both plates pressure, power, argon/oxygen ratio, gas flow and substrate were set. Postthermal processing (RTP) with about 50 Kmax ramps and oven processes with about 3 to 5 Kmax ramps have been used. The layers have been characterized optically by ellipsometry, the surface by SEM and AFM, microstructure by TEM, XPS and AES in cross sections. Chemical and electrochemical properties have been measured on specimen in the chemical lab. A high influence of the oxidation and annealing regime have been found. The crystallite structure and accordingly the properties like the chemical stability change significantly. Interesting results have been found with the temperature shift during the annealing process. The heating up time has a very high influence on the structure. Both oxides are compared regarding chemical stability and sensing properties in order to estimate the usability in various sensor applications.

1:30pm H2-2.2 Properties of Low Dielectric Constant Nanoporous Polymeric Films and Dependence on Porosity, C.M. Flannery, S. Kim, D.G. Hedley, National Institute of Standards and Technology, M.R. Balasubramanian, NIST at DIBEM, Belgium
The demand for miniaturization in the microelectronics industry requires that the RC (capacitance -capacitance) factor be lowered to increase the interconnection delay, clock rate and power loss. The most promising way to achieve this is by introducing porosity into the dielectric film material. This is achieved by depositing a sacrificial nanoporous technique. Initially composed of a mixture of thermally stable and chemically stable material, polymer particles, the nanoporous film dries out during burning. The resulting nanoporous matrix structure exposed to a gaseous species is then passivated. The resulting structure is then covered with a thin dielectric film material.

Introducing porosity has a very large effect on the critical properties of the material. The stiffness properties increase drastically and the material may be too soft or brittle too be used in a commercial application. The dielectric constant of the nanoporous polymer is high and depends on porosity, distribution and void ratios of void ratio. The variation of Poisons ratio is not at all understood. In this work we show the techniques of surface acoustic