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PROGRAM AND ABSTRACTS

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of the films, measured by nano-indenter, were varied according to the structure of carbon incorporated films.

EP-15 Plasma Polymerization Treatment of Wood Surfaces Using RF Glow Discharges of Siloxanes and Siloxones-hydrocarbons Mixtures, *R.P. Mota, R.Y. Honda, J.C. Teixeira, M.E. Kayama, E.A. Aramaki, R.P.C. Costa, G. Telles, M.A. Algatti*, UNESP - Universidade Estadual Paulista, Brazil

Plasma Polymerization process is a widely applied technique in several technological issues encompassing microelectronics and biomaterials industry. The main reason is that such kind of polymers are pinhole free and can resist to the attack of mild acidic and moderate basic solutions.

This paper deals with plasma polymerization process of wood surfaces by RF excited glow discharges in Siloxanes, and Siloxanes-Hydrocarbon mixtures in atmospheres at pressures running from 70 to 200 mTorr. Polymeric films of 0,1 mm and 0,5 mm thick where grown over polished Pinus and Cedrus surfaces in glow discharges with 10 to 30 minutes duration.

Polymeric films were submitted to adhesion Scotch™ tape and distilled boiling water. The results showed that all the films presented a good adhesion showing that the polymeric films were efficient in wood's surface protection.

Optical and scanning electron microscopy were performed on several samples. The results showed that the wood porosity was completely recovered by polymeric films resulting in a good wood's impermeability. These recovered wood surfaces may resist the exposition to an extremely aggressive environment like boiling water, for instance.

EP-16 CrN Hard Coatings Deposited with PVD Methods on Tools for Wood Machining, *M.A. Djouadi, C. Nouveau, P. Beer*, ENSAM, France

Well known and widely used tools modified with hard coatings are still not applied to wood industry. Difficulties come from mechanical, physical and tribological properties of wood and of wood based materials together with particular parameters of their processing (average cutting speed about 80m/s, average feed speed about 80m/min). The aim of our study was to examine the influence of chromium nitride coated cutting tools on wood based product machining. Industrial tools made of cemented carbide were modified with two methods: triode and magnetron sputtering and with two structures of chromium nitride: cubic CrN and hexagonal Cr_2N and with three modes: on rake face and clearance face jointly and just on rake or just on clearance face. The material subjected to cutting was wood based material called OSB (Oriented Standard Board), which is made of glued veneer flakes pressed together. This is abrasive material widely used in building industry. OSB has got determined mechanical parameters. The process was conducted on ordinary wood routing centre. The scope of experiment involved: optimisation of coating deposition parameters, physical and mechanical characterisation of the coatings and evaluation of reduction of cutting tools edges and spindle motor power consumption.

Comparison have been made between the results obtained for CrN and Cr_2N deposited by triode and magnetron sputtering methods. It appears that tools modified with CrN coating have had twice lower edged reduction after 3000m of the cutting path and six times longer.

EP-17 Plasma Immersion Ion Implantation Treatment of AISI304 Stainless Steel Employing a Hybrid Elevated-Temperature, Low-Voltage and Ambient Temperature Process, *X.B. Tian, Z.M. Zeng, B.Y. Tang, P.K. Chu*, City University of Hong Kong

AISI304 stainless steel is widely used in the industry due to its good corrosion resistance. Nevertheless, its relatively low surface hardness and inferior wear resistance lead to a short working lifetime, especially for abrasively stressed components made of the materials. High-frequency low-voltage plasma immersion ion implantation (HLPIII) has been shown to be an effective means to enhance the surface properties of steels. However, experimental results indicate that the total amount of implanted nitrogen does not exceed 20 atomic% under these conditions. In this work, we present a novel hybrid treatment process incorporating a sequence of processes using high and low voltages to attain a thicker modified layer with higher surface nitrogen concentration. The samples are characterized by AES, GXRD, microhardness testing and other techniques.

EP-18 Surface Modification of 9Cr18 Bearing Steel by Ti and C Co-implantation and TiC Deposition in a Plasma Immersion Configuration, *Z.M. Zeng, X.B. Tian*, Department of Physics and Materials Science, City University of Hong Kong, *B.Y. Tang, P.K. Chu*, City University of Hong Kong

9Cr18 Martensitic stainless steel (AISI440) is often used as an aerospace bearing material because of its good corrosion resistance. Previous studies have shown that bearing failure occurs mainly on its working surface or in the near surface region. Therefore, surface modification techniques provide an important way to prolong the lifetime of industrial bearings. Plasma immersion ion implantation (PIII) circumvents the line-of-sight restriction characteristic of conventional ion beam implantation and is an effective method to treat complex-shaped industrial components. In this work, sequential titanium and carbon PIII is conducted in conjunction with TiC film deposition on 9Cr18 samples using metal arc plasma sources. The microhardness and wear properties of the treated samples were measured to assess the surface property enhancement. Our results indicate that Ti+C implantation and TiC deposition can significantly enhance the microhardness and wear properties and reduce surface friction. We will also discuss the influence of different processing and experimental conditions on the tribological properties of the treated samples.

EP-19 Elevated Temperature Oxidation Behavior of Cr-Al-N Films Synthesized by Cathodic Arc Plasma Deposition, *S.S. Kim, J.G. Han*, Sung Kyun Kwan University, Korea

CrN coatings are successfully being applied for various metal forming molds and dies, for plastic manufacturing as well as for machinery parts [1]. However, with a reported oxidation threshold temperature of 700 °C, CrN coatings may be limited for oxidation resistant application at elevated temperature. For this reason, higher oxidation resistance than that of CrN coatings is required. It is well known that the TiAlN coatings have higher oxidation resistance because of the Al_2O^3 layer formation on the film surface at elevated temperature [2].

In this study the Cr-Al-N films were deposited on the hot working tool steels (AISI H13steel) by cathodic arc plasma deposition (CAPD) process. The films were deposited at various substrate bias voltages of 0-400V and different target current ratio of chromium and aluminum. Relative chemical compositions of the deposited Cr-Al-N films were evaluated by EDX as well as AES. The microstructure and morphology were studied by XRD and SEM respectively.

The microstructure of Cr-Al-N films were strongly depended upon target current ratio of the chromium and aluminum as well as substrate bias voltages. Moreover, we found that the microhardness of the Cr-Al-N films were higher than that of the CrN film. Detail results including oxidation behavior will be presented.

[1] B. Navinsek, P. Panjan, I. Milosv, Industrial applications of CrN coating, deposited at high and low temperatures, Sur. & Coat. Technol., 97 (1997) 182-191

[2] A. Joshi, H. S. Hu, Oxidation behavior of titanium-aluminum nitrides, Sur. & Coat. Technol., 95 (1997) 499-507

EP-20 Corrosion of Stainless Steel Coated with Thick TiN/Ti Multilayers, *M. Flores, S. Muhl, C. Piña*, UNAM, Mexico

TiN/Ti multilayers, 0.1-0.5 μm, have been deposited by various PVD methods to improve the toughness of coating wear resistance. It is also known that such multilayers improve the corrosion resistance of stainless steel and high speed steels. The titanium layer helps to reduce the incidence of pinholes, that arise because of the irregularities in substrates surfaces, and decrease the porosity of subsequent TiN coatings by improving this layer's microstructure. Similarly the titanium layer helps to decreased the pitting corrosion through the formation of TiO_x. It can be expected that thicker Ti layers, >0.5μm, should produced even greater corrosion resistance. In this work we report the results of preparing multiple thick TiN/Ti layers on 316 stainless steel substrates by reactive magnetron sputtering. The corrosion resistance of these layers was studied by means of potentiodynamic polarization in a 0.5 M NaCl solution. We present the results of corrosion studies, composition analysis and the hardness measurements as a function of Ti layer thickness, number of layers and bias applied to substrate during the multilayer formation.

EP-22 Luminecent and Structural Characteristic of NaCl Doped Al_2O_3 Coatings Prepared by Ultrasonic Spray Pyrolysis Technique, *M. García, E. Martínez, O. Alvarez-Fregoso*, UNAM, Mexico

NaCl doped Al_2O_3 luminescent (photo and cathodoluminescent) coatings have been prepared by ultrasonic spray pyrolysis deposition process. The substrate temperature and the doping concentration in the start solution were varied. It is observed that the crystallinity of the films do not depend