Symposium A

Poster Session PA1 - Monday, October 9

A501 - THEORETICAL MODELLING AND CHARACTERIZATION OF CERAMIC MATRICES APPLIED TO JOURNAL AEROSTATIC POROUS BEARINGS

Carlos Alberto Fortulan (EESC-USP), Benedito Moraes Purquerio (EESC-USP), Rodrigo Nicoletti (EESC-USP) and Zilda de Castro Silveira (EESC-USP)

This paper presents the development of advanced ceramic air bearing approach for material manufacturing and the aerostatic porous bearing mathematical modelling. The results show that there was homogeneous distribution of the pores in the alumina matrix as well as an average pores diameter around 0.10 [μm] with small standard deviation. In the mathematical modelling it was verified that the parameter related to porous medium (Gamma) strongly affects the load capacity and stiffness of the aerostatic bearing.

A502 - PRODUCTION AND CHARACTERIZATION OF ELECTROLYTIC NI-NB COMPOSITE COATINGS

Alain Robin (EEL-USP) and Rômulo Queiroz Fratari (EEL-USP)

In this work, Nb powders (20 micrometers size) and Ni were co-electrodeposited on carbon steel. Coatings of approximately 100 micrometers thickness were produced using 10, 20 and 40 mA cm-2 cathodic current densities. The effect of cathodic current density, stirring rate (240, 400 and 550 rpm) and concentration of Nb powders (20 and 40 g L-1) on Nb incorporation and deposit morphology was studied. Microhardness and adhesion of the coatings were evaluated. The corrosion behavior of the composites was investigated in 3% NaCl and 20% H2SO4 solutions using polarization technique.

A503 - WOODGRAIN DEFECT ON TINPLATES USED IN THE MANUFACTURE OF FOOD CONTAINERS

Paulo Atsuki Suzuki (Faenquil), Vilmar Alves Souza (Faenquil), Alfredo Moises Sarkis (Faenquil) and Alain Laurent Robin (Faenquil)

The well-known "Flandres" foils used in the manufacture of food containers consist in tin electrocoated steel strips. The woodgrain defect is a highly reprovable defect and consists in the formation of alternate bands of different reflectivity (light/dark), which looks like longitudinally cut wood. Characterization of woodgrain defect on tinplates was performed by scanning electron microscopy and X ray diffraction. The influence of steel strip characteristics, such as chemical composition, microstructure, thickness, roughness and dirtiness, on the occurrence of woodgrain was investigated.

A504 - STUDY OF THE DAMAGE ON GROUNDED HARD CHROMIUM COATED ROLL IN THE ALKALINE CLEANING SECTION OF CSN CHROMIUM PLATING PLANT

Alain Laurent Robin (Faenquil), Durval Rodrigues Junior (Faenquil), Alfredo Moises Sarkis (Faenquil) and Vilmar Alves Souza (Faenquil)

Chromium electroplated steel strips used in package applications are produced in continuous industrial plants, where the strips pass at high velocity through several sections. In this work, were compared the results of the characterization of the damaged and not damaged hard chromium coated rolls located in the same plant. The characterization of these rolls was performed using optical and scanning electron microscopy, energy dispersive spectroscopy and X-ray diffraction. The causes of the roll degradation were investigated under simulated conditions in a laboratory pilot plant (1:10 scale).

A507 - MICROSTRUCTURAL ANALYSIS OF FE-CR STAINLESS ALLOYS SUBMITTED TO ABNORMAL GLOW DISCHARGE IN NITROGEN ATMOSPHERES

Paulo A.P. Wendhausen (UFSC), Armando Sarmiento Santos and Joel L.R Muzart (UFSC)

Nitrogen like carbon can dislocate the region of existence of austenite phase in Fe-Cr alloys for regions with chromium content higher than 13%1, 2. In this case, nitrogen transforms the ferritic phase of Fe-Cr alloy in austenitic phase or in austenitic and chromium nitride phases3. Cooling sufficiently rapid from high temperature in the austenitic region allow also the formation of mantensitic phase4, 5. In present work the micro structure of Fe-Cr alloys treated in an abnormal glow discharge of nitrogen is studied. Different micro structures were obtained for different contents from chromium

A508 - NITROGEN DIFFUSION IN FE-CR ALLOYS UNDER AN ABNORMAL GLOW DISCHARGE

Paulo A.P. Wendhausen (UFSC), Joel L.R. Muzart and Armando Sarmiento Santos

After certain time in contact with nitrogen gaseous atmospheres Fe-Cr alloys reach the thermodynamic equilibrium with the gaseous atmosphere according with the Sieverts' law. This equilibrium situation has a strong dependence of the process temperature and also of the chromium content in the alloy. In this work the non equilibrium plasma of an abnormal glow discharge has been utilized to enrich with nitrogen the surface of Fe-Cr alloys and then, to study the nitrogen diffusion during the process. The variables of the process are the chromium content of the alloy and the time of nitrogen diffus

A510 - ELASTIC MODULUS, HARDNESS AND STIFFNESS OF CRN AND CR2N THIN COATINGS

Pierre-Yves Jouan (UVHC), Arnaud Tricoteaux (UVHC) and Adilson Rodrigues da Costa (UFOP)

Industrial applications of chromium nitride coatings are increasing due to their excellent corrosion and wear properties related to their fine grained and low stress structure which allows large thickness depositions PVD coatings. In this work we present results issued from nanoindentation tests.

A512 - ADHERENCE OF THIN FILMS: CHARACTERISATION BY LASERS PULSES AND SHOCK RELATED WAVES

Flavio Sandro Lays Cassino (UFOP) and Adilson Rodrigues da Costa (UFOP)

The characterisation of thin coatings is a relevant problem in which several groups of materials scientists are well concerned after some decades. Differents techniques have being developed while others experiment up grading and validation. Indentation, bending tests and laser assisted procedures are amongst the most commum essays [1-2].

A514 - PLASMA SURFACE TREATMENT OF POLY(HYDROXYBUTYRATE-CO-VALERATE) (PHBV)

Eliana Aparecida de Rezende Duek (PUC - SP), Pedro Augusto de Paula Nascente (UFSCar), Marcelo Juni Ferreira (LNLS), Larissa M. Prisco Pinheiro (UFSCar) and Betina Mara Pereira Ferreira (PUC - SP)

The surfaces of poly(hydroxybutyrate-co-hydroxyvalerate) (PHBV) was modified by oxygen plasma treatments. The physical and chemical surface characteristics were evaluated by contact angle tests, scanning electron microscopy (SEM), atomic force microscopy (AFM), and X-ray photoelectron spectroscopy (XPS). The plasma treatments caused an enhancement in both contact angle and roughening, altered the surface morphology, inserted polar groups, and, consequently, enhanced the hydrophilicity for PHBV polymers.

A515 - TRIBOLOGICAL PROPERTIES OF NITRIDED AUSTENITIC STEELS SUBMITTED TO CATHODIC HYDROGENATION

Cleber Alexandre Silva (UFPR), Neide Kazue Kuromoto (UFPR), Francisco Carlos Serbena (UEPG), Juliana Fatima Souza (UFPR), Carlos Eugênio Foerster (UEPG), Carlos Mauricio Lepienski (UFPR), Carlos Jose Siqueira (UFPR) and Silvio Rutz Silva (UEPG)

Tribological properties of nitrided austenitic stainless steel before and after cathodic hydrogenation were investigated by reciprocating sliding tests. The friction coefficient profiles are modified by hydrogenation due to phase transformations and cracks induced by hydrogen.

POSTER SESSION PA2 - TUESDAY, 10 OCTOBER

A518 - STRUCTURE AND PROPERTIES OF TI-B-N COATINGS

Henrique Duarte Fonseca Filho (PUC-Rio), Carlos Sanchez Tasayco (PUC-Rio) and Fernando Lazaro Freire Jr (PUC-Rio)

Attempts to improve some properties of TiB2 coatings have been carried out by adding nitrogen in their composition and by controlling the internal stress of the coatings. However, a good adherence, between film and substrate, is sometimes difficult to obtain due to high internal stress of these films. For that a correlation between deposition parameters and film properties are obtained. The present work discusses the influence of the experimental deposition parameters on some properties of Ti-B-N coatings produced by reactive direct current (DC) magnetron sputtering.

A519 - ELECTRICAL PROPERTIES OF THE DIODE AL/PPY/AU UNDER METHANE ATMOSPHERE

Milton Soares Campos (UNIP)

The electrical analysis of the diode Al/PPy/Au doped with dodecylbenzene sulfonic acid (DBSA) with concentration of 0.5 mol/L has been investigated at room temperature in dark by means of J-V, C-V and C-f measurements. From J-V characteristics of Al/PPy/Au structure, ideality factor of the diode and barrier height values of 2.69 and 0.70 eV respectively, where obtained in nitrogen atmosphere using a thermionic emission theory.

A520 - DIAMOND DEPOSITION ON SINTERED TUNGSTEN CARBIDE USING BORIDE INTERFACE

Vladimir Jesus Trava-Airold (INPE), Elilton Rodrigues Edwards (INPE) and Evaldo José Corat (INPE)

Diamond-coated cemented carbide is a promising candidate for cutting tools, but a critical problem is the poor adhesion strength between the coating and the substrate. We are studying an interface for diamond growth in WC-Co inserts using a boronization process.

A521 - MICROSTRUCTURAL CHARACTERIZATION AND CORROSION BEHAVIOR OF AISI 304 AUSTENITIC STAINLESS STEEL LASER SURFACE TREATED

Maria Clara F. Ierardi (UNICAMP), Maria Aparecida Pinto (UNICAMP) and Maria Aparecida Larosa (UNICAMP)

Austenitic AISI 304 stainless steel, used in surgical instruments, was subjected to laser surface treatments with and without melting. Microstructural characterization was carried out and corrosion behavior was analyzed by electrochemical tests before and after laser treatments. The electrolytes consisted of water and enzymatic detergents that are used in the cleaning procedures of the surgical instruments. Laser surface hardening revealed a fine austenitic grains structure. After laser remelted, samples presented a fine austenite dendritic. Moreover, corrosion resistance was improved.

A524 - INFLUENCE OF SPRAYING PARAMETERS ON THE CORROSION, WEAR AND FRICTION PROPERTIES OF CR3C2NICR- HVOF COATINGS SPRAYED ON AA7050 T7

Josep Maria Guilemany (CPT-UB), Nuria Espallargas (CPT-UB), Patricia Hatsue Suegama (Poli-USP), Marina Magnani (IQ-Unesp) and Assis Vicente Benedetti (IQ-Unesp)

Aluminum alloys are largely used in aeronautical industries. However, they have poor corrosion resistance at high temperature and tribological properties. Cermets coatings prepared by HVOF can be an alternative to improve these surface properties. The Cr3C2-NiCr coatings were sprayed by HVOF on an AA 7050-T7 alloy under refrigeration with liquid nitrogen and different spray conditions. They were characterized by optical and scanning electron microscopy. The wear resistances were studied by ball-on-disk and rubber-wheel tests and the electrochemical behavior by open-circuit potential measurements and electrochemical impedance spectroscopy after 26 hours in 3.5% NaCl solution.

A527 - INVESTIGATION ON PROTECTIVE EFFECT OF POLY(O-METOXYANILINE) FILMS AGAINST CORROSION OF 7075 ALUMINIUM ALLOY

Fabio Augusto Mattenhauer (USP/São Carlos), Sandra Regina de Moraes (USP/São Carlos) and Artur de Jesus Motheo (USP/São Carlos)

Corrosion protection the aluminium alloy 7075, using poly(o-metoxyanline) (POma) coatings, was investigated by potentiodynamic polarization in NaCl solution. Chemically obtained POma and PAni films were prepared by the dispersion of undoped form in N-methyl-2-pyrrolidinone, deposited on AA-7075 plates and characterized by infrared spectroscopy. POma films promote a greater shift in corrosion potential (DEcor » 90 mV) than PAni films and are more efficient for corrosion protection. Studies using open circuit potential measurements and accelerated corrosion tests also confirm this efficiency and indicate that POma films can be utilized to substitute the chromate-based inhibitors.

A528 - TRIBOLOGICAL ASPECTS OF LTCC GREEN TAPES MILLING

Arlindo Cesário de Oliveira (EPUSP), Mario Ricardo Gongora Rubio (IPT), Roberto Eduardo Bruzetti Leminski (EPUSP), Eliphas Wagner Simões (EPUSP), Maria Lúcia Pereira da Silva (EPUSP) and Marcos Tadeu Pereira (IPT)

The objective of this work is to show some characteristics of the milling process of Low Temperature Co-fired Ceramics (LTCC) green tapes and some needs of tribological point of view to build several devices as sensors, fluidic devices, among several others. Some tribological parameme rters of the developed process are also showed, and the use of different tools and its results are presented.

A531 - TRIBOLOGICAL PROPERTIES OF SAE 1020 CARBON STEEL AFTER CHROMIUM RECOIL IMPLANTATION

Antônio Fernando Beloto (INPE-LAS), Mário Ueda (INPE-LAP), Carina Barros Mello (INPE-LAP) and José Osvaldo Rossi (INPE-LAP)

This work studies the tribological behavior of SAE 1020 carbon steel after chromium recoil implantation by plasma immersion ion implantation (PIII) technique. A chromium film is deposited on steel samples by electron beam and then treated in PIII system. Surface microhardness increased by about 27% and friction coefficient decreased of about 50% for treated sample. For one treated sample, whose friction coefficient decreased by about 54% in comparison to reference sample, its wear increased by about 10%. PIII treatment changes the wear mechanism from a predominantly adhesive to abrasive mode.

A533 - ELEMENTAL AND PHASE DISTRIBUTION ON DISK BRAKING SURFACE MAPPED WITH μRAMAN, BACKSCATTERED ELECTRONS AND X RAYS

Marcos Roberto Farias Soares (FRASLE S.A.), Gilson Giuriatti (IF-UFRGS), João Batista Marimom da Cunha (IF-UFRGS), Ruth Hinrichs (IG-UFRGS) and Marcos Antonio Zen Vasconcellos (IF-UFRGS)

The interaction between disk and pad is an important tribological problem. The efficiency of the braking system depends on this interaction, with formation of a friction layer at the interface. In this work, this layer is investigated with traditional X ray mapping and novel phase mapping micro-Raman. Raman maps indicate the oxidation is a transformation occurring in the disc volume near the surface and show the formation of islands of a carbonaceous film containing variable composition originated from elements included in the pad formulation.

A534 - SURFACE PROPERTIES OF A TRANSPARENT GLASS-CERAMIC AFTER ION-EXCHANGE TOUGHNING

Edgar Dutra Zanotto (UFSCar), Thiana Berthier (UFSCar) and Oscar Peitl (UFSCar)

The fracture toughness, KIC of a glass-ceramics and its parent glass, before and after íon exchange (IE), were investigated. An increased of KIC of the glass-ceramics was observed after IE. In addition all samples showed better surface appearance.

A535 - ROCKING CURVE AND PHOTOLUMINESCENCE CHARACTERIZATION IN POROUS SILICON IMPLANTED WITH NITROGEN BY PLASMA IMMERSION ION IMPLANTATION

Antonio Fernando Beloto (INPE/LAS), José Carlos Nunes Reis (INPE/LAS) and Mario Ueda (INPE/Plasma)

Porous silicon samples prepared by anodization were implanted with nitrogen by plasma immersion ion implantation (PIII). The samples were characterized before and after implantation. The photoluminescence and the rocking curves were obtained using a Spectrophorimeter SPEX with ultraviolet exciting light and a high resolution X-ray diffractometer respectively. After PIII treatment, the photoluminescence measurements showed that the emission increased with the implantation time and a blue shift was also observed. X-ray measurements showed an expansion of the rocking curve that can be explained by the correlation between the coverage of silicon crystallites by SiHx and the lattice expansion.

A537 - IMPROVED MOISTURE AND HYDROCARBONS BARRIER OF EPOXY RESIN-BASED COATING

Ronaldo Domingues Mansano (Laboratório de Sistemas), Marly Grinapel Lachtermacher (CENPES - Petrobras) and Peter Lubomir Polak (Laboratório de Sistemas)

In order to improve the surface characteristics of epoxy resin coatings, a surface treatment by fluorine-containing plasma was used to develop a coating with low surface free energy and improved moisture and hydrocarbons resistance. Contact angle analysis and salt spray test was used to verify the surface enhancement as a barrier against aggressive environments. The improvement in contact angle of water was 50% and of raw petroleum was 130%. Salt spray test made possible to verify that the coating fluorination decreases the chance of mettalic structure contact with an aggressive environment.

A540 - STUDY OF EDM MACHINED SURFACES WITH NICKEL AND CHROMIUM COATING ELECTRODES

Alberto Arnaldo Raslan (UFU), Tiago Brassarola Borsani (UFU) and Flavia Cavalcanti Miranda (UFU)

The use of noble metal electrodes can confer special characteristics to materials machined by spark-erosion. In this work, the purpose was investigate the EDM machining by metal electrodes coated with chromium and nickel, for industrial process, for evaluate the possibility of enrichment of the machined surface with these elements.

A541 - SURFACE CHARACTERISTICS OF NITROGEN IMPLANTED TI-13NB-13ZR BIOMEDICAL ALLOY

Sandra Giacomin Schneider (USP), Frederico Augusto Pires Fernandes (USP), Elidiane Cipriano Rangel (UNESP) and Mario Ueda (INPE)

We performed a Plasma Immersion Ion Implantation (PIII) on a surface of Ti-13Nb-13Zr biomedical alloy prepared by arc melting with unstable martensitic α' microstructure. The results were availed by means of surface roughness, microstructure and wettability. Nitrogen PIII treatment turned surface more hydrophobic increasing contact angle and decreasing the surface free energy values. A martensitic structure was revealed and an increase in average roughness too due to nitrogen insertion and applied temperature.

A542 - EVALUATION OF HYDROXYAPATITE COATINGS MICROSTRUCTURE ACQUIRED WITH FACVD TECHNIQUE

Carlos Pérez Bergmann (UFRGS), Luis Alberto dos Santos (UFRGS) and Rafael Mello Trommer (UFRGS)

Flame assisted chemical vapor deposition was firstly employed to obtain hydroxyapatite coatings. Influence of deposition parameters in the microstructure of hydroxyapatite coatings was evaluated. The coatings varied its thickness between 66 and 757μm, depending on the deposition parameters. Increase of deposition time and precursor solution flux leads to thicker coatings. Ca/P molar ratio determined the phases in the coatings. The decrease of substrate temperature leads to thicker coatings. The macro porosity can be reduced with the increase of initial deposition temperature in the substrate.

A543 - VEGETAL BASED DIELECTRIC FLUIDS USED ON ELECTRICAL DISCHARGE MACHINING PROCESS

Alberto Arnaldo Raslan (UFU), Tiago Brassarola Borsani (UFU) and Flavia Cavalcanti Miranda (UFU)

The present paper aims to evaluate the potential use of vegetal oil based dielectric fluids on the sinking electrical discharge machining process (EDM). Technically, this fluid showed satisfactory results comparing to the conventional fluids used on EDM, during severe regimen, beyond it is renewable and non-toxic.

A544 - HOW C INFLUENCES THE DRY THERMAL OXIDATION OF 6H-SIC?

Fernanda Chiarello Stedile (IQ-UFRGS), Israel J.R. Baumvol (CCET-UCS and IF-UFRGS), Gabriel Vieira Soares (PGMICRO-UFRGS) and Cláudio Radtke (PGMICRO-UFRGS)

Silicon carbide thermal oxidation was investigated by oxygen isotopic tracing and nuclear reaction analysis techniques. Thermal oxidation was performed in different steps using either natural oxygen or oxygen enriched in the 18O isotope. Depth profiling of this last isotope revealed remarkable differences between the oxidation mechanism of SiC and Si, evidencing a strong oxygen exchange close to the SiO2/semiconductor interface in the former case.

A545 - COMPARISION OF POROUS SILICON PREPARED BY ANODIZATION ETCHING IN HF-ETHANOL AND HF-ACETONITRILE SOLUTIONS

Antonio Fernando Beloto (INPE/LAS), Cláudia Renata Borges Miranda (INPE/LAS) and Neidenei Gomes Ferreira (INPE/LAS)

The goal of this work is to discuss the morphology and photoluminescence in porous silicon samples from anodization process. HF solutions with ethanol and/or acetonitrile were used, under galvanostatic conditions at different etching times and current density. Photoluminescence changes for the different structures were observed by Raman spectroscopy associated to their morphology studied from scanning electron microscopy images. The macropores` shape and size changes may be controlled and are strongly dependent on the electrolyte nature, the anodic current, and silicon resistivity.

POSTER SESSION PA3 - WEDNESDAY, 12 OCTOBER

A547 - EVALUATION OF HARDNESS OF COLORED INTERFERENCE THIN FILMS BY NANOINDENTATION

Margareth Spangler Andrade (CETEC), Célia Regina Oliveira Loureiro (CETEC), André Luiz Moraes Costa (UFP) and Rosa Maria Rabelo Junqueira (CETEC)

The deposition of interference film by electron deposition is an alternative way for the formation of colored protective layers on the surface of stainless steels. This process involves the growth of chromium oxide films. The hardness of the interference films on stainless steel was evaluated using depth-sensing nanoindentation tests. It was observed a great influence of the film thickness and the indentation size effect on the hardness measurements, that was minimized by using normalized data. It was concluded that the interference films have hardness about 60% of the substrate hardness.

A550 - FILM THICKNESS MEASURED BY RAMAN MICROSCOPY

Joao Bertolino (UFSC), Alfredo Tiburcio Nunes Pires (UFSC), Roberto Marchiori (UFSC) and Alexandre Lago (UFSC)

The density profile of a polymeric thin film can be measured by Raman signal strength as function of the depth z from the film surface, determining the density profile n(z) as function of the depth z. A mathematical model based on the Fourier transform of Raman signal and laser beam intensity distribution was used to determine the thickness of a polymeric film of P4VP deposited on a glass surface. The Raman signal strength is $S(z0) = \int [n(z) \cdot I(z,z0)]\,dz$, I(z,z0) is the laser intensity. The results were compared with the film thickness measured in its cross section with an optical microscope

A552 - CORRELATION BETWEEN THE SEVERITY CONDITIONS OF RUBBER COMPOUNDS IN A LABORATORY TEST AND ITS ABRASION PATTERN

Argemiro Aragão Costa (Pirelli Pneus), Fernando Aleixo Cardoso (Pirelli Pneus) and Deniol Katsuki Tanaka (EPUSP)

The wear performance evaluation of tyre-tread rubber compounds is an expensive and challenging task, which involves numbers of laboratory tests and time-consuming outdoor tests. To shed a light in this activity, it will be presented correlation between the rubber compounds wear test severity and the abrasion pattern.

A555 - MÖSSBAUER SPECTROSCOPY STUDY OF AUTOMOTIVE DISC BRAKES AFTER EXTREME BRAKING CONDITIONS

Ruth Hinrichs (IG-UFRGS), Marcos Zen Vasconcellos (IF-UFRGS), João Batista Marimon da Cunha (IF-UFRGS), Marcos R Soarers (FRAS-LE SA) and Gilson Giuriatti (IF-UFRGS)

Mössbauer Spectroscopy has been used to study the disc surface submitted to extreme braking conditions with a polymer matrix composite pad in a test performed at the dynamometer on the test bench of FRAS-LE industries. The braking condition was severe enough to cause intensive cracking of the disks, from hairline cracks to fissures 15 mm long and several mm deep. During the braking process the film formed dynamically between the brake disc surface and the brake pad designated "third body", play a very important role in the braking efficiency.

A557 - INFLUENCE OF SECONDARY CARBIDE PRECIPITATION AND RETAINED AUSTENITE ON WEAR RESISTANCE OF HIGH CHROMIUM WHITE CAST IRONS

Pedro Bernardini (UFSC), Patricia Ortega Cubillos (UFSC) and Luis Augusto Torres (Tractebel Energia)

This work shows the influence of heat treatment process (desestabilization) parameters (initial condition: as cast or annealed, time and temperature) on the secondary carbide fraction and retained austenite content of high chromium white cast irons, ASTM A532 -class II D used in thermoelectric power plants mills. It is also showed the influence in the hardness and wear resistance of the alloy. It is also shown that the initial condition has a major effect on the time and temperature needed to achieve maximum hardness and wear resistance.

A558 - HARDNESS STUDY USING THE NANOINDENTATION TECHNIQUE IN STAINLESS SMA

Fabiana Cristina Nascimento (UFPR), Jorge Otubo (ITA), Paulo Roberto Mei (UNICAMP) and Carlos Mauricio Lepienski (UFPR)

This work presents a martensite hardness study using the nanoindentation technique in Fe-Mn-Si-Cr-Ni-(Co) stainless shape memory alloys (SMA). Were analyzed samples with austenitic grain size between 75 and 129 microns after several thermo-mechanical cycles treatment. Nanoindentation test were realized in deformed samples which presented a volume fraction between 40% and 75% for stress induced martensite. Martensitic phase presented much higher hardness than the austenitic matrix for all grain size tested.

A559 - THE INFLUENCE OF OXYGEN PLASMA ETCHING ON FIELD EMISSION CHARACTERISTICS OF NITROGEN-DOPED AMORPHOUS DIAMOND-LIKE CARBON FILMS (A-C:H:N)

Gilberto Marrega Sandonato (INPE), Marcos Massi (ITA), Daniela Genovesi (ITA) and José Américo Neves Gonçalves (INPE)

This work studies the influence of oxygen plasma etching on the field emission characteristics of nitrogen-doped amorphous diamond-like carbon films. The films were obtained by magnetron sputtering deposition, varying the nitrogen concentration in a mixture of methane and argon, adding up a flow of 5 sccm. The films were submitted at a plasma etching process in a Reactive Ion Etching (RIE) reactor using a mixture of oxygen and argon, adding up a flow of 25 sccm, and varying the etching time in steps of 10, 15 and 20 seconds. The current density and threshold field were both investigated.

A560 - X-RAY AND TEM-SAED CHARACTERIZATION OF FRICTION LAYER ON BRAKE DISK SURFACE AFTER EXTREME BRAKING CONDITIONS

Marcos Roberto Farias Soares (FRASLE S.A.), Marcos Antonio Zen Vasconcellos (UFRGS) and Ruth Hinrichs (UFRGS)

Phases formed on the braking disk worn against a PMC pad were identified with x-ray and electron diffraction measurments. The comparison between pristine and worn surfaces shows magnetite formation induced by the severe friction process. TEM and SAED show the presence of amorphous and polycrystalline multielemental third body particles and abundant contaminated magnetite. Different of other investigations where the presence of hematite was observed, in the presente case the reducing atmosphere formed during high temperature reactions of resins seems to prevent full oxidation of the iron.

A561 - ABRASIVE WEAR OF POLYURETHANE CONVEYOR BELT CLEANER

Adilson Rodrigues da Costa (UFOP), Flavio Sandro Cassino (UFOP) and Dennis Coelho Cruz (UFOP)

In its main use, belt cleaners and scraper, the polyurethane has shown a good wear resistance when it effects the cleanness of conveyor belt. The results of the experiments had allowed to evidence the properties of polyurethane under the point of view of the wear.

A563 - CVD DIAMOND GROWN ON SAE 1045 STEEL SUBSTRATE

Vladimir Jesus Trava Airoldi (INPE), Evaldo Jose Corat (INPE), Carmo Peliciari Lima (Unicamp), Amauri Amorim (Metrocamp), Jose Eduardo Mateus Villas Boas (USF), Osmar Roberto Bagnato (LNLS) and João Roberto Moro (USF)

Cutting and abrasion tools with the diamond hardness and the steel toughness is a goal. For the CVD diamond growth on steel substrate it is necessary the use of a barrier layer between the steel and the diamond. The molybdenum sprinkled thermally showed that it is possible as a barrier. The heat treatment of the steel-molybdenum set was studied having the objective to diminish the molybdenum porosity and improving the barrier efficiency. The diamond growth on SAE 1045 steel was possible through the introduction of the molybdenum barrier sprinkled thermally. This barrier was efficient preventin

A564 - COATING SOLIDIFICATION DURING PLASMA TRANSFERRED ARC PROCESSING

Danielle Bond (UFPR) and Ana Sofia Climaco Monteiro D`Oliveira (UFPR)

Hardfacing using welding processes contributes to the increase on lifetime of several components. Among these processes PTA has been recognized for the homogeneous and dense deposits, with excellent metallurgical bond using filler metal in the powder form. An atomized Co alloy was deposited

using continuous and pulsed current with similar current intensity (medium). Results suggested that the atomized features of the filler alloy overcome the pulsed current effects and determined the solidification structure development, as the structure refinement mentioned in the literature was not observed.

A566 - MICROSCOPIC OBSERVATIONS RELATED TO THE BREAKDOWN OF ANODIC OXIDE FILMS ON MAGNESIUM

Jefferson Porto Borba (UFRGS) and Gerhard Hans Knörnschild (UFRGS)

Among the metals used as structural materials, magnesium is the less noble one. Its corrosion resistance depends strongly on the integrity of its oxide film. Thickening of the natural oxide by anodization is a common process to improve the corrosion resistance of magnesium alloys.

A578 - THE STUDY OF ABRASIVE WEAR IN FURROW OPENER TIPS OF NO-TILL PLANTERS MADE OF ADI AND SAE 1060 FORGED STEEL

Vilson João Batista (UFRGS), Ângelo Vieira dos Reis (UFPEL), Antônio Lilles Tavares Machado (UFPEL) and Amauri Cruz Espírito Santo (UFPEL)

This work intended to quantify the wear of a commercial tool made of SAE 1060 forged steel, in comparison with another one, with same geometric configuration, constructed in Austempered Ductile Iron (ADI), in the direction to establish it useful life of these furrow openers operating in sandy soil.

A582 - THE INFLUENCE OF SILICATE GLASSY PHASE IN EROSION OF ALUMINA CERAMICS AT HIGH TEMPERATURES

Carlos Pérez Bergmann (UFRGS), Juliane Vicenzi (UFRGS) and Caio Marcelo Marques (UFRGS)

In this work it was investigated the phenomenon of the degradation of alumina based ceramic bodies, which were submitted to erosive attack from ambient temperature up to 800°C. Particularly, the erosion resistance was related to samples microstructure. The eroded material was alumina with glass additions in the ratio of 0, 1, 2, 4 and 8 w%.

A583 - ALTERNATIVE CUTTING TOOLS TO MACHINING COMPACTED GRAPHITE IRON

Olivério M.M Silva (CTA/AMR), Marcos V. Ribeiro (FEG-UNESP), José Vitor Candido Souza (INPE) and Maria C. A. Nono (INPE)

The life of ceramics cutting tools is an important parameter in the performance evaluating of the machining on compacted graphite iron. Therefore, this paper reports the performance of a Si3N4 cutting tool developed in laboratory applied on compacted graphite iron. The cutting speed was 300, 400, and 500m/min on turning. The roughness increased with the increasing of the cutting speed, and the tool wear lowered at the cutting speed of 300 m/min for a cut length of around 3750 m. These results show potential use of this cutting tool in compacted graphite iron by automobile industries.

A584 - FRICTION COEFFICIENT AND WEAR STUDIES BETWEEN TI6AL4V ALLOY AND TI6AL4V WITH DLC FILMS

Gill Capote Rodrigues (INPE), Luiz Francisco Bonetti (INPE/ITA), Lucia Vieira Santos (INPE/ITA), Polyana Alves Radi (INPE/ITA) and Vladimir Jesus Trava-Airoldi (INPE)

This paper shows initial studies of friction coefficient and wear on DLC (Diamond-Like Carbon) films with 20% hydrogen content. A pin-on-disk tribometer was used to do the measurements in humid air and in nitrogen in different sliding speed. The films were obtained with a very high adherence on Ti6Al4V polished surface by using the low-cost EP-DC PACVD method discharge. The properties of the films allow us to apply it on industrial and spatial devices that have sliding parts and coating protection.

A585 - EVALUATION OF ALUMINUM ANODIC COATING ON DEPLOYMENT SATELLITE MECHANISM'S PULLEYS

Polyana Alves Radi (INPE/ITA), Lucia Vieira Santos (INPE/ITA), Lauro Benassi (Fibraforte) and Vladimir Jesus Trava-Airoldi (INPE)

The present case of study is to establish an approach to evaluate friction and wear arise from the use of pulley machined on aluminum alloy with anodic coating and with DLC films. The proposal was to simulate the tests conditions in terms of load and sliding operation time required for space application. The tests were carried out at a normal force 1N with steel pin. All tests were kept at the same sliding speed of 10rpm (0.015m.s-1) for the 30 cycles in moist air (40%RH) for both samples. The wear was measured by the G99-95 ASTM standard test method.

A590 - INSTRUMENTED INDENTATION OF AUSTENITIC STAINLESS STEELS NITRIDED BY PLASMA AND SUBMITTED TO CATHODIC HYDROGENATION

Silvio Luis Silva (UEPG), Francisco Carlos Serbena (UEPG), Neide Kazue Kuromoto (UFPR), Carlos Maurício Lepienski (UFPR), Juliana Fátima Souza (UFPR) and Carlos Eugênio Foerster (UEPR)

Austenitic stainless steels samples type AISI 304 were submitted to glow-discharge plasma nitriding. After this process the samples were hydrogenated by cathodic charging. Instrumented indentation was made to measure locally hardness. Variation of hardness from point to point was correlated to the phases formed by hydrogenation and plasma nitriding. The results show the measurements of hardness depend on the indented area, presenting different values for different regions.

A596 - VIABILITY OF INSTRUMENTED INDENTATION TESTING TO EVALUATE THE RESIDUAL STRESSES OF PHYSICAL VAPOUR DEPOSITION COATINGS

Roberto Martins de Souza (USP), Giuseppe Pintaude (UTFPR) and Marjorie Benegra (USP)

This paper presents a study on the use of the model proposed by Suresh and Giannakopoulos to calculate thin film residual stresses. The values of residual stresses were obtained through X-ray diffraction and instrumented indentation testing and poor correlation was obtained when comparing the values from both methods.

A598 - FORMATION OF POROUS SURFACE LAYERS ON ALSI13 ALLOYS

Aloísio Nelmo Klein (UFSC), Roberto Binder (EMBRACO),

Carlos Eduardo Santana (UFSC), Alice Gonçalves Osorio (UFSC), Erildo Dorico (UFSC), José Biasoli Mello (UFU) and André Avelino Pasa (UFSC)

The objective of this work was the preparation and characterization of porous surface layers on top of AlSi13 substrates. AlSi13 is an alloy with 13 wt.% of silicon of high industrial interest due to its machinability properties. The anodization of this alloys was used to produce a surface layer with improved mechanical and chemical properties.

A600 - USE OF ELECTROCHEMICAL TESTS FOR ASSESSMENT OF CORROSION-EROSION SYNERGISM IN STAINLESS STEELS

Neusa Alonso-Falleiros (USP), Diana López (USP) and André Paulo Tschiptschin (USP)

The mechanisms of degradation of an AISI 304 stainless steels under static corrosion, liquid impingement and corrosion-erosion were studied using polarization curves. The synergism between erosion and corrosion was evaluated by measuring the shift in the critical current density for different conditions. Micro-cutting, extensive plastic deformation and pitting corrosion were observed depending on the test conditions

A601 - EFFECT OF THE ABRASIVE PARTICLE SIZE ON THE EROSION RATE OF A CASING STEEL

Cherlio Scandian (UFES), Henrique Cruz Vieira (UFES), João Paulo Campos (UFES) and Marcelo Camargo Macêdp (UFES)

Experiments were carried out with scope of determining the erosion rate of an API 5CT K55 steel and to verify the effect of the abrasive granulometry on the mass loss of the material. The results obtained in the experiments of erosion would be compared to values available in the literature.

A603 - PHOTOCURRENT CHEMICAL IMAGE GAS SENSOR

Walter Jaimes Salcedo (USP), Francisco Javier Ramirez Fernanadez (USP) and Mauro Sergio Braga (USP)

The chemical image generation is an important issue for modern sensing technologies as electronic noses or tongues. A number of sensors are based on the variation of the depletion layer of the MOS system that can be measured by using ac photocurrent induced by illumination of the modulated light. The present work reports the photocurrent response of the MOS sensor to the Hydrogen gas moiety. The Au and Pd metals in contact form the gate of the MOS sensor. Depending on the laser excitation regions the photocurrent showed different sensitivity necessary condition for chemical image gas sensor.

A604 - A INCLINED PLANE DEVICE TO STUDY STATIC FRICTION COEFFICIENT

Anivandro Bonatto Nascimento (Universidade Tecnológica), Andre Barbosa Carvalho (Universidade Tecnológica), Carlos Henrique Silva (Universidade Tecnológica) and Amilton Sinatora (Escola Politécnica da USP)

This work presents the result of the development of equipment to measure the static friction coefficient. A test methodology was applied to analyze the influence of the surface finishing and the solid lubricant in the static friction of materials used in sliding bearings. Considering literature results the test equipment is able to produce reproducible results and cam be considered proper for static friction coefficient studies in dry or lubricated condictions.

A607 - FRACTURE BEHAVIOR OF PORCELAIN/TI/NI-CR RESTORATION IN PROSTHODONTICS SYSTEMS

Luis Augusto Rocha (Universidade do Minho), Luis César Fontana (UDESC), Rubens Maribondo Nascimento (UFRN), Antonio Eduardo Martinelli (UFRN), Andrea Aladim Araujo (UFRN) and Edith Ariza Avila (Universidade do Minho)

The success of ceramic-metal joints used in prosthodontics restorations depends on the adhesion of the porcelain counterpart onto the metallic substrate. The present work evaluated the effect of plasma deposited titanium layers on the fracture behavior of porcelain-metal systems with tribocorrosion tests in artificial saliva environment.

A608 - ELECTROCHEMICAL SURFACE TREATMENTS OF TI FOR MESENCHYMAL STEM CELLS CULTURE

N. Nardi (UFRGS), F. H. Silva (UFRGS), K. Santim (UFRGS), A. C. S. dos Santos (UFRGS), G. P. Dias (UFRGS) and Luís Frederico P. Dick (UFRGS)

New surface modifications on Ti for prosthetic implants were developed and tested. The following treatments and their combinations were studied: Pitting, anodizing, pitting followed by anodizing and chemical deposition or not of Ca-phosphates, resulting in six different surface modifications. Mesenchymal stem cells were cultured on these Ti substrates to evaluate the quality of the proposed surfaces modifications for implants. Biological analysis and MEV analysis were carried out to characterize the nano and micropores on the surfaces as well as the growth and modification of stem cells.

A609 - SURFACE CHARACTERISTICS OF IRON SINTERED IN HOLLOW CATHODE DISCHARGE: STUDY OF A PREVIOUS DEPOSITION TREATMENT

Aloisio N Klein (UFSC), Silvio Francisco Brunatto (UFPR) and Joel L.R. Muzart (UFSC)

The influence of a previous deposition treatment on the final amount of Cr and Ni deposited and diffused into the surface of iron parts sintered in HCD was studied by: a) deposition treatment; and b) deposition plus HCD sintering. The results indicate the presence of 6.5 at.% Cr and 6.9 at.% Ni, with 50 um depth concentration profiles.

A615 - TRIBOLOGICAL CHARACTERIZATION OF UNALLOYED IRON SAMPLES SINTERED AND NITRIDED AT SINGLE-STEP IN PLASMA REACTOR

Gisele Hammes (UFSC), Aloísio Nelmo Klein (UFSC), José Biasoli de Mello (UFU), Deise Rebelo Consoni (UFSC) and Cristiano Binder (UFSC)

This work reports results of a comparative analysis between two plasma processing routes for nitriding of sintered unalloyed iron samples. The specimens were characterized using scanning electron microscopy, laser interferometry and a universal wear machine. The results show a significant increase in pores sealing, although with a greater irregularity in the thickness of the nitrided layer, in the plasma sintered when compared to the

conventionally sintered sample. Also, the plasma sintered samples did not present a significant improvement in wear resistance.

A616 - TRIBOLOGICAL PROPERTIES OF TIB2 THIN FILMS SYNTHESIZED WITH DC SPUTTERING TECHNIQUE

Bernabé Rebollo Plata (PUC-RIO), Fernando Lazaro Freire Jr. (PUC-RIO) and Carlos Manuel T. Sanchez (PUC-RIO)

Titanium diboride is becoming an important ceramics due to its high hardness, strength and excellent chemical resistances to corrosive environments even at elevated temperatures. It also has high oxidation resistance, and high thermal and electrical conductivity. All these combinations of properties suggest enormous potential of TiB2 thin films in wear, abrasion resistance and oxidation resistant applications. Due to its high electrical conductivity, it has also the potential for use as interconnects for semiconductor applications.