

OFFICIAL PROGRAM - ORAL



18th IFHTSE CONGRESS

International Federation for Heat Treatment and Surface Engineering

July 26th - 30th, 2010

Hotel Intercontinental | Rio de Janeiro | Brazil



July 28th - Wednesday

Room Quartzo A

CORROSION

8:10 am	Tribo-corrosion behaviour of S-phase against S-phase tribopairs	Joseph Buhagiar
8:30 am	Comparison of laser and electron beam welding of steel sheets treated by nitrooxidation	Milan Maronek
8:50 am	Effects of Si and Nb on oxidation behavior in high purity ferritic stainless steels	Yasushi Kato
9:10 am	Mechanical and physical properties of carbon S-phase on stainless steel, produced by carbon supersaturation	Ralph Hunger
9:30 am	Study on the corrosion resistance and electric conductivity of the SS316L by ion implantation	Xun CAI
9:50 am	Effect of aluminum coating by magnetron sputtering on corrosion resistance of magnesium alloys	Jin ZHANG
10:10 am	Coffee Break + Poster Session	

TRIBOLOGY

10:40 am	The influence of the superficial deformation on the fatigue resistance of the austempered ductile iron	Francisco José Saldanha Franco
11:00 am	Influence of cutting speed on the surface integrity of AISI 304L austenitic stainless steel parts	Thompson Júnior Ávila Reis
11:20 am	Effect of grain size on machining strength in an austenitic stainless steel	Nivaldo Lemos Coppini
11:40 am	Nanofretting behavior of Si(100) and its coating	Linmao Qian
12:00 noon	Surface fatigue and wear resistance of thin and thick hard coatings	Priit Kulu
12:20 am	Wear characteristics of solid multilayer composite coatings under Sliding/rolling contact and poor grease lubrication condition	Qiang GUO
12:40 pm	Lunch	
2:00 pm	Special Tribute Session to Honour Professor Tom Bell - Prof. Dr. Hanshan Dong: Tom Bell Memorial & Current Status of S-phase Surface Engineering	
3:00 pm	Special Tribute Session to Honour Professor Tom Bell - Prof. Dr. Marcel A. J. Somers: Low Temperature Nitriding and Carburizing of Stainless Steels	
3:40 pm	Coffee Break + Poster Session	
4:20 pm	Special Tribute Session to Honour Professor Tom Bell - Prof. Dr. Allan Matthews: Duplex and Special Engineered Coatings	
5:00 pm	Special Tribute Session to Honour Professor Tom Bell - Prof. Dr. Frank Ernst: Thermodynamics of Carbon Para-equilibrium and its Potential for Surface Engineering of Structural Alloys	

July 29th - Thursday

Room Quartzo A

PLASMA TECHNOLOGY

9:10 am	High durability of cutting edges made of nanocrystalline cemented carbides sintered by the pulse-plasma method	Maciej Jan KUPCZYK
9:30 am	Influence of dilution level on oxidation resistance of plasma transferred arc NiCrAlC coatings	Marjorie Benegra
9:50 am	Effect of plasma nitriding on the wear and corrosion properties of Hastelloy CW2M super-alloy	Frederico Augusto Pires Fernandes
10:10 am	Coffee Break + Poster Session	
10:40 am	Hybrid surface treatment technology for the increase of hot forging dies	Jerzy Smolik
11:00 am	Characterization of materials submitted to plasma ion implantation	José Luiz Toledo
11:20 am	GLOBAL 21	Zoltan Kolozsvary

PVD AND CVD

11:40 am	Cleaning prior to PVD/CVD-Coating, determination of the cleanliness and chemical decoating of PVD/CVD-Layers	Dr. Henry Percy Ederle
12:00 noon	Effect of additional elements on microstructure and properties of Cr-N based composite coatings	Mingdong Bao
12:20 pm	The deposition of Ni/Cr-Cr ₃ C ₂ composite coatings by Arc-EB hybrid technology	Jerzy Smolik
12:40 pm	Lunch	
2:00 pm	Impact wear performance of thin hard coatings on tic cermets	Renno Veinthal
2:20 pm	Ti-Al-Si-C-N hard coatings synthesized by hybrid arc enhanced magnetron sputtering	Kewei Xu
2:40 pm	Influence of the Nitriding and TiAlN/TiN Coating Thickness in The Mechanical Properties of a Duplex Treated H13 Steel	Ricardo D. Torres
3:00 pm	PVD and Duplex Solutions for Die Casting Moulds	Marcelo Dornelles Pimenta
3:20 pm	PVD Coatings for Presshardening applications	Andreas Reiter
3:40 pm	Coffee Break + Poster Session	
4:20 pm	Microstructure and micromechanical characterization of a duplex multilayer coated H13 tool steel	Abel André Cândido Recco
4:40 pm	Non-destructive Evaluation of Residual Stress of Brush Electro-Plating Nickel Coating by Surface Acoustic Wave	Liu Bin

Chemical Composition, Microstructure, and Mechanical Properties of Ti-Al-Si-C-N Hard Coatings Synthesized by Hybrid Arc Enhanced Magnetron Sputtering System

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Abstract:

Ti-Al-Si-C-N coatings with different Al contents are deposited by hybrid Arc-enhanced magnetic sputtering. X-ray diffraction, scanning and transmission electron microcopies, X-ray photoelectron spectroscopy, energy dispersive X-ray analysis, micro-hardness tests, and pin-on-disc tribometry are employed to characterize the coatings. Energy dispersive X-ray analysis indicates that the Al concentrations in the Ti-Al-Si-C-N coatings increase with the Al target power, whereas the Ti contents decrease. X-ray diffraction, high-resolution transmission electron microscopy, and X-ray photoelectron spectroscopy reveal a nanocomposite microstructure consisting of nanocrystallite and amorphous phases, that is nc-(Ti,Al)(C,N)/nc-AlN/a-Si₃N₄/a-C/a-Si. The X-ray diffraction peak shifts to a lower angle compared to the standard position if the Al concentration increases. The residual compressive stress in the Ti-Al-Si-C-N coatings may be the reason. The hardness of the Ti-Al-Si-C-N coatings remains high at 38 GPa if the Al concentration is relatively low. The high hardness is considered to stem from a strong, thermodynamically driven and diffusion-rate-controlled phase segregation that leads to the formation of a stable nanostructure by self-organization. The friction coefficients of the Ti-Al-Si-C-N coatings are found to be about 0.3 and lower than those of Ti-Si-N coatings, suggesting the formation of a graphite-like lubricious phase of amorphous carbon. In spite of the existence of Al in the Ti-Al-Si-C-N coatings, the materials have high potential in high temperature applications.

Keywords: Ti-Al-Si-C-N coatings, microstructure, mechanical properties, hardness