Tribology and Mechanics of Coatings and Surfaces
Room Golden State Ballroom - Session MC-ThP

Tribology and Mechanics of Coatings and Surfaces Poster Session

MC-ThP-1 Role of Layer Position During Thermo-Mechanical Loading of Trilayers, ***Megan J. Cordill [megan.cordill@oeaw.ac.at]***, *Claus O.W. Trost,* Erich Schmid Institute of Materials Science, Austrian Academy of Sciences, Austria

Thermo-mechanical loading of thin films on rigid substrates is common method to assess film stresses as a function of temperature. However, these experiments have historically only been performed on single layer films even though multilayers are used in all advanced thin film technology. To illustrate the feasibility of measuring the thermo-mechanically induced stresses of multiple layers simultaneously, different architectures of brittle-ductile-brittle and ductile-brittle-ductile trilayers on silicon were heated with in-situ X-ray diffraction (XRD). The use of XRD provides individual film stress evolution simultaneously to understand delamination mechanisms of the trilayer architecture. The main aspects presented will be the strain evolution under thermo-mechanical loading as a function of layer position. Following Mo and Cu films from next to the substrate, to the middle position, and as the top surface film found that position in the trilayer architecture significantly influences the stress-temperature curve, thus the deformation mechanism due to thermo-mechanical loading.

MC-ThP-2 The Effect of Surface Built-Up Defect on the Coating Process of Automotive Sheet, ***JIANFENG HE [13166296136@163.COM]***, Shanghai Jiao Tong University, China

At present, facing fierce competition in automotive sheet market,defects prevention has been the most important task during cold rolling production.As a key process of automotive sheet(eg. Outer panel), surface coating plays an important role to improve surface quality and errosion resistance. In order to analyze the effect of built-up defect to coating of automotive sheet surface treatment, 3-dimension morphology of build-up defect is measured.The build-up behavior in coating process is also investigated in this article,which is helpful for defect inspection and judgement.

MC-ThP-3 Investigation of Wear Resistance of 7075 Aluminum Alloy Modified Through Plasma Electrolytic Oxidation (PEO), ***Bruna Freitas [bruna.michelledefreitas@gmail.com]***, *Ricardo Torres, Carlos Laurindo,* PUCPR - Pontifícia Universidade Católica do Paraná, Brazil*; Luciane Santos,* Vrije Universiteit Brussel, Belgium*; Paulo Soares,* PUCPR - Pontifícia Universidade Católica do Paraná, Brazil

The 7075-aluminum alloy is widely used in the aerospace and automotive industries due to its excellent mechanical properties. However, its relatively lower wear resistance may limit its applications. The PEO surface modification process is a method that can improve the surface properties of the 7075 alloy. Thus, this study evaluates the wear resistance of the 7075 alloys modified by PEO. The Al7075 samples were sanded with #500 and cleaned. The PEO process was carried out using a bipolar power source, with an electrolyte based on sodium phosphate and sodium hydroxide, with 352V, 350V, and 475V and a 1000 Hz frequency for 5, 10, and 20 minutes. The samples were characterized using SEM and EDS techniques, X-ray Diffraction, and wear tests. The results show that the oxide surface formed is homogeneous, porous, and crack-free. The XRD results indicate the presence of Al2O3 phases, and EDS showed that the elements Al and O were predominantly present in all coatings after treatment. The tribological resistance significantly improved compared to the substrate.

MC-ThP-4 Nanoindentation and Micropillar Compression at Cryogenic Temperatures, ***Eric Hintsala [eric.hintsala@bruker.com]***, *Kevin Schmalbach, Douglas Stauffer,* Bruker Nano Surfaces, USA

Mechanical reliability at low temperatures is required for environments in energy and aerospace applications. Due to its highly localized measurement capabilities, nanomechanical approaches can be useful for isolating individual regions within a more complex microstructure or component or testing of thin films.In general, both modulus and yield strength gradually increase with decreasing temperature,but more sudden shifts in behavior can also be observed, such as phase transformations or ductile-to-brittle transitions. In situSEM testing enables visualization of the deformation mechanisms coupled with the measured mechanical properties helping complete the interpretation of the behavior.Alow temperature control system has been developed for the Hysitron PI89PicoIndenter (Bruker, USA) for in situ SEM testing that enables continuous temperature control from -130°C to 50°C. Independent temperature control on the tip and sample to enable proper temperature matching in vacuum and minimizes drift. The temperature dependent mechanical response of two metallic samples, Nitronic 50 and Tungsten, both by nanoindentation and micro-pillar compression.

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