

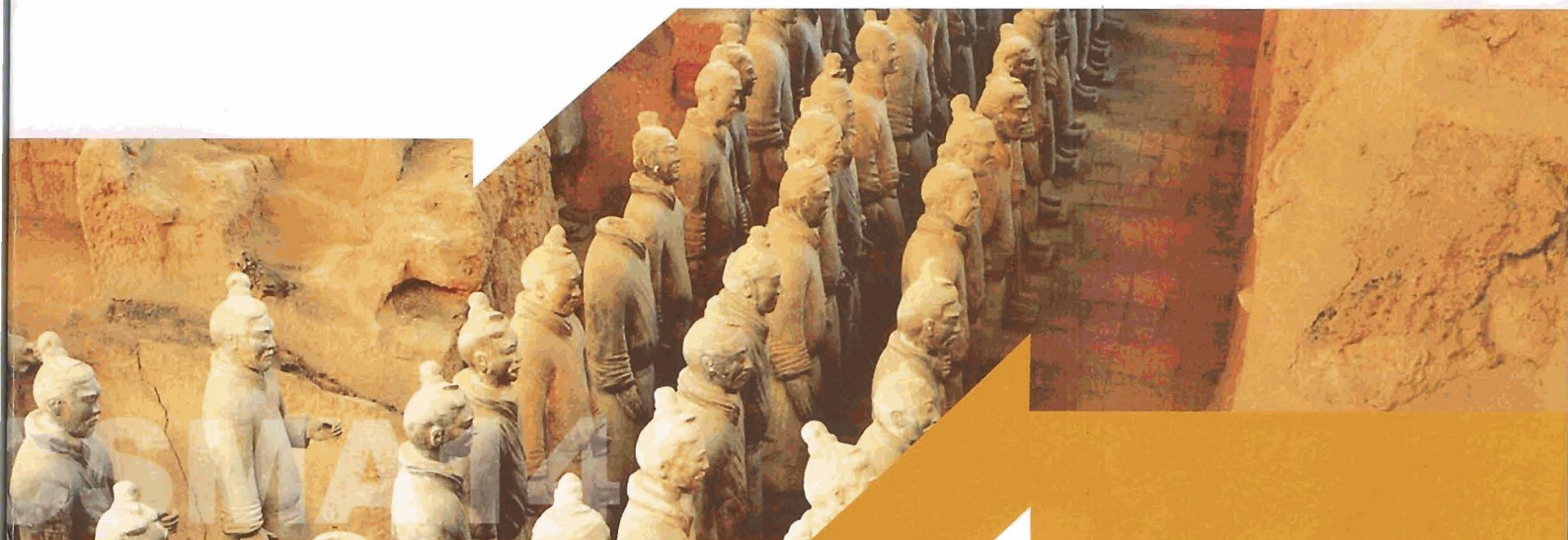
Final Program and Abstracts

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(Fundamental Aspects of the Deformation and Fracture of Materials)

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ICSMA14

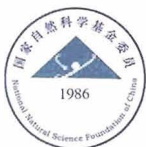
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Thermal Stability of Titania Films Prepared by Micro-Arc Discharge Oxidation

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Abstract

Titanium and its alloys are widely used in the aerospace, marine, and biomedical industry due to their unique bulk properties such as high strength-to-weight ratio and melting temperature, good corrosion resistance, and favorable biocompatibility. However, in some applications, components made of titanium or titanium alloys exhibit poor wear resistance under stationary or dynamic loads. Recently, the use of micro-arc discharge oxidation (MDO) to improve the surface properties of titanium and titanium alloys has attracted much interest. By utilizing micro-arc plasma discharges sustained at a high voltage in aqueous solutions, various oxide films can be formed on these metals to improve their surface properties such as wear and corrosion resistance as well as bioactivity. In high-temperature applications, the thermal stability of the films is crucial. In this work, porous titania films are prepared on titanium by MDO followed by annealing at different temperatures to improve the properties and thermal stability of the materials. The composition, structure, and surface morphology of the films are characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), and surface texture tests. Vickers indentation, scratch tests, and pin-on-disc friction tests are also employed to investigate the micro-hardness of the films, adhesive strength between the film and substrate, as well as surface mechanical and tribological characteristics. The effects of post-annealing on the properties of the MDO titania films and the underlying enhancement mechanism are discussed.

Keywords: Micro-arc discharge oxidation (MDO); Titania film; Annealing; Thermal stabilities and Surface properties

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