

Mechanical Surface Stability and Reliability under High Temperature Fields

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It is widely known, that many coating materials show very significant temperature dependence with respect to their mechanical properties, especially with respect to Young's modulus and Yield Strength or Hardness.

In the work it will be shown how dramatic the influence of this dependency on the mechanical performance of real coating-substrate systems and generally layered surfaces can be. Pure normal as well as more general multi-axial loading conditions for quasi-static and dynamic (oscillatory or impact) contact situations are discussed.

In order to avoid failure due to flawed stability and life time prediction by ignoring this material behavior it is very important to determine mechanical properties at high temperature.

By doing so, not only experimental difficulties with respect to surface tests must be overcome but also new concepts for the correct analysis and interpretation of the measured data are necessary. Meaning e.g., the classical Oliver and Pharr method for analyzing indentation experiments or scratch tests do not suffice when high temperature fields are present. The authors will present the necessary extensions and how they have to be applied.

Keywords

temperature dependence

mechanical properties

life time prediction

indentation

scratch