

Needs and opportunities in high temperature tribology

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Tribology is the science and technology dealing with friction and wear phenomena that occur when two contacting solids undergo relative motion. These phenomena directly affect the energy consumption and life of machines. The ever increasing demands on compact, lightweight and high performance systems have led to a drastic increase in the transmitted energy densities. Operation of moving machine components are therefore more and more conducted under severe contact conditions. In applications such as automotive, aerospace, nuclear industries and several metal working processes, extreme conditions are typically inevitable due to high temperatures. The operation of mechanical systems at elevated temperature has serious consequences in terms of efficiency, performance and reliability owing to the influence of temperature on friction and wear characteristics of materials.

Salient effects induced due to operation of tribological interfaces at elevated temperatures are the increased rate of tribochemical reactions (mainly oxidation) and degradation of mechanical properties of the materials. High temperature tribological phenomena are complex as illustrated in Figure 1. Some of these effects are associated with the bulk material but also the changes on the surface and near surface region play an extremely vital role in determining the friction and wear characteristics i.e., the tribological performance of the system. The investigations of the formation and action mechanisms of such near-surface phenomena are necessary not only for fundamental understanding but are also crucial in developing technologies for controlling friction and wear as well as models for predicting the tribological performance of a system respectively.

This presentation intends to review some of the characteristics inherent to high temperature tribology.

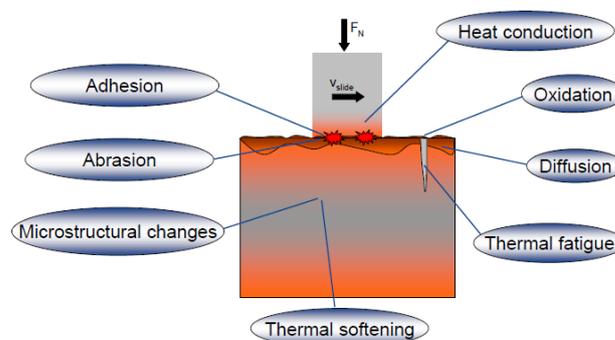


Figure 1 Schematic showing the complexity of a sliding contact at elevated temperature

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