

Toughening Materials for Ultimate Resistance to Wear

Hong Liang, Texas A&M University

Wear of materials remains to be one of the most costly failures of products. This is particularly so for systems in motion, such as total joint replacement, passenger cars, and manufacturing machines where mechanical impacts and environmental attack pose challenges to rubbing components. However, the current design of structural materials has been primarily focused on the hardness as the sole property. The increased hardness associates with brittle fracture that leads to severe loss of materials. In this presentation, discussion will be given on the nature of conflicts between hardness and toughness of materials. This leads to the advantages in composites and multi-phase materials. Further discussion will be about the microstructural design of quasicrystal alloys and their effects on mechanical properties and wear performance. It will be revealed that by microstructural design and adding toughness in certain phases, it is possible to predict the failure and to achieve ultimate resistance to wear.