Abstract of Keynote Speech 4

Recent Advances in Materials Characterization Using Instrumented Indentation Tests

Warren Oliver

Nanomechanics, Inc., KLA, United States

Abstract

Three new instrumented indentation testing techniques will be discussed. They include high temperature, high strain rate and two dimensional testing.

Instrumented indentation testing provides unique opportunities to study strain rate effects on the strength materials. In situ high temperature indentation testing to measure the relationships between temperature, strain rate and strength has received considerable interest in recent times. In this regard, data from in situ dynamic nanoindentation testing up to 550 C on commercial purity aluminum will be presented and compared to the values from literature. The same concepts can be applied to measure properties at high strain rates. Results for Molybdenum up to 1100 C will also be discussed. High strain rate indentation testing results will be presented and compared to macroscopic literature results.

Finally, the first results from a new system which retains the high-performance measurement capabilities in the direction normal to the surface of the sample and adds the equivalent signals parallel to the surface will be presented. The same sensitivity, range and dynamic performance (including frequency specific experiments) are available simultaneously and continuously in both directions. The ability to measure not only load and displacement but stiffness and phase angle at specific frequencies parallel to the surface continuously and simultaneously with these same measurement in the normal direction has resulted in entirely new results concerning the onset of sliding between two bodies in contact. Unique new data concerning the initiation of slip at micro asperities, friction and wear, lubrication, scanning surface topology, mechanical property mapping and multidimensional characterization of structures can now be investigated.