Recent Developments in a Novel Dynamic Testing Technique for Advanced Nanoscale Mechanical Property Measurements

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Nanomechanical testing, often nanoindentation, has been well-established at a basic level for characterization of small volumes of material and low-dimensional structures, with the size scale of the applications dictating the physical testing size scale required. The aspiration to understand nanoscale material behavior in new capacities consequently encourages the enhancement and further development of nanomechanical testing capabilities.

A powerful new dynamic testing technique used to perform nanoscale mechanical property measurements has been recently developed. This universally-applicable technique (nanoDMA® III) has been designed and optimized for the thorough nanoscale characterization of all material types, from ultra-soft hydrogels to hard coatings.

Key developments and optimized features of nanoDMA III empower researchers with previously unmatched and unprecedented capabilities, including:

- Newly developed CMX algorithms, providing a truly Continuous Measurement of X (X = hardness, storage modulus, loss modulus, complex modulus, tan-delta, etc.) as a function of contact depth, frequency and time
- High bandwidth electronics for a greatly improved signal to noise ratio and faster testing cycles
- In-situ drift correction capabilities for maximum accuracy during long test cycles
- Enhanced dynamic characteristics and dynamic testing range (0.1 to 300 Hz), enabling increased accuracy and applicability on the broadest range of materials
- Coupled AC and DC force modulation for reliable and quantitative nanoscale dynamic characterization from the initial surface contact

Several application examples will be presented to highlight and signify the potential of this new technique to help researchers attain new levels of understanding in nanoscale mechanical behavior of materials.