TI PREMIER SERIES

HYSITRON®

TI Premier

Enabling Nanomechanical Research

Highlights

- Reliable quantitative nanomechanical and nanotribological characterization, applicable from traditional materials to the state-of-the-art thin films and beyond
- Essential tool for basic to advanced nanomechanical testing, utilizing Hysitron's capacitive transducer technology for superior characterization of hardness and reduced modulus
- Nanowear technique provides quantitative characterization of tribological properties of materials
- *In situ* SPM imaging enables topographical visualization of the surface prior to performing a measurement along with nanometer scale accuracy in test positioning for maximum test reliability
- Versatile system configuration, easily adaptable to meet specific research needs

Applications

- Polymers
- Alloys
- Metals
- Thin Films
- Nanostructures

TI Premier

The **TI Premier Series** was specifically designed to deliver quantitative and highly reliable nanomechanical characterization within a compact platform. Built upon proven Hysitron technology, the TI Premier provides an essential toolkit for your nanoscale mechanical and tribological testing. Standard testing to advanced research can be accomplished utilizing the versatile configuration of the TI Premier, while numerous technique upgrades are available to meet the potential diversity of your future characterization needs.

The TI Premier makes nanoscale mechanical and tribological characterization simple and consistent. This dedicated system provides a variety of standard nanoscale characterization techniques with unparalleled accuracy and precision. The TI Premier comes with Hysitron's exclusive *in situ* SPM imaging capability and capacitive transducer technology, making the system applicable to the widest range of materials and devices. Motorized staging, top-down color optics, anti-vibration system, environmental enclosure, control software, and fast digital electronics decrease time to results and ease instrument use. The TI Premier offers automated testing routines for increased testing throughput and minimized operator interaction.

The TI Premier provides an assortment of core techniques that are essential to laboratories entering into nanoscale characterization. The system is particularly well suited for the investigation of nanoscale mechanical and tribological properties of non-time-dependent materials under ambient conditions.

The TI Premier Series also offers systems tailored for high temperature testing, dynamic characterization, and testing over multiple length scales. The instrument can be easily configured with multiple application-specific characterization packages to provide a dedicated solution to your current and future measurement needs.

9625 WEST 76TH ST. MINNEAPOLIS, MN 55344 TEL: 1-952-835-6366 FAX: 1-952-835-6166 WWW.HYSITRON.COM

TiN Thin Film Application

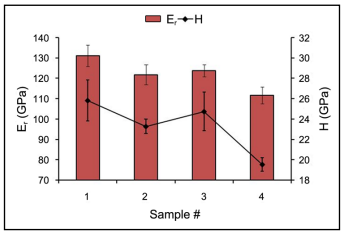
Four TiN thin films of 50 nm thickness deposited at various deposition conditions have been investigated.

Sample Information

- Sample 1 - DC Sputter
- Sample 2 - Pulsed Sputter (100 kHz Pulse Cycle)
- Sample 3 - ICP-assisted DC Sputter (100 W Power)
- Sample 4 - ICP-assisted DC Sputter (200 W Power)

Nanoindentation

Subtle, yet discernible differences in mechanical properties (E_r, H) from differing sputter conditions.



In Situ SPM Imaging

Qualitative Film Topography Analysis

- Topographical features indicate pre-imaging for test site specification is important
- Highly accurate positioning and test placement
- Additional information about the deformation in post-scanning
- Quantitative RMS Surface Roughness

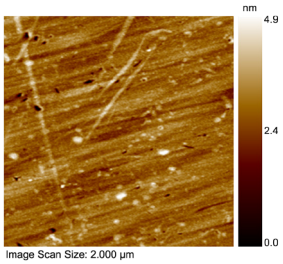
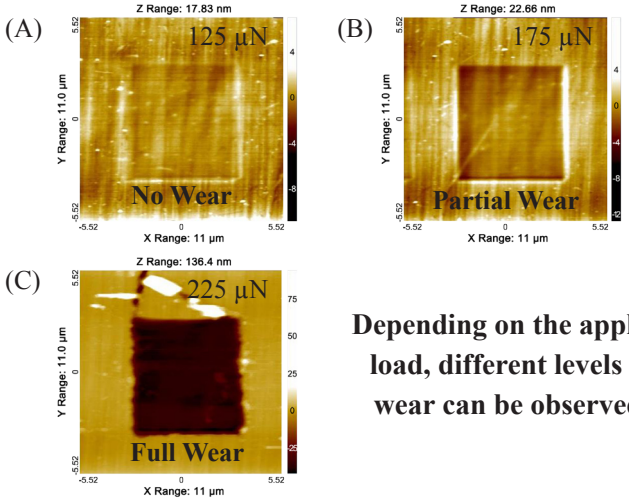


Image Scan Size: 2.000 µm

Sample	RMS Roughness (nm)
1	0.40
2	0.33
3	0.34
4	0.43

Nanowear on Sample 3

Discernible results for 50 nm sample.



Depending on the applied load, different levels of wear can be observed.

Specifications

Nanoindentation
- Normal Load Range: 70 nN to 10 mN (30 mN)
- Normal Displacement Range: 2 A to 5 µm

Nanowear
- Maximum Load: 100 µN

Integrated *In Situ* SPM Imaging
- Performed with same probe as mechanical characterization
- Imaging Force: <70 nN

Controller
- Digital

Optics
- Magnification: 10X
- Top-Down Configuration

Upgrade Options

- **Scratch Testing** - Quantify scratch resistance, critical delamination forces, friction coefficients, and more with simultaneous normal and lateral force/displacement monitoring
- **nanoDMA® III** - Dynamic Mechanical Analysis technique for universal investigation of materials from ultra-soft up to hard thin films
- **Modulus Mapping™** - Quantitative map of the storage/loss modulus using the *in situ* SPM scanning function
- **nanoECR®** - Conductive nanoindentation system capable of providing simultaneous in-situ electrical and mechanical for investigating material deformation and stress induced transformation behavior
- **Higher Loads** - Extend the characterization capabilities towards higher forces for indentation and scratch
- **Active Vibration Isolation** - Piezoelectric driven active vibration dampening for faster stabilization time and optimum results
- **Environmental/Heating System** - xSol™ 400 and xSol™ 600 for investigation at non-ambient conditions

TI Premier SS r1.f

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TI Premier Allows for Complex Mechanical & Tribological Characterization