HYSITRON®

NANOMECHANICAL TEST INSTRUMENTS

Platform Systems

Mechanical Testing Solutions

- Hardness – Modulus
- Dynamic Analysis
- Scratch, Wear, Friction
- Surface Roughness, Imaging
- Environmental Control
- Electrical Properties
- Stress/Strain, Strain Rate

Dual-Head TI 950 TriboIndenter® powered by the *performech* ®

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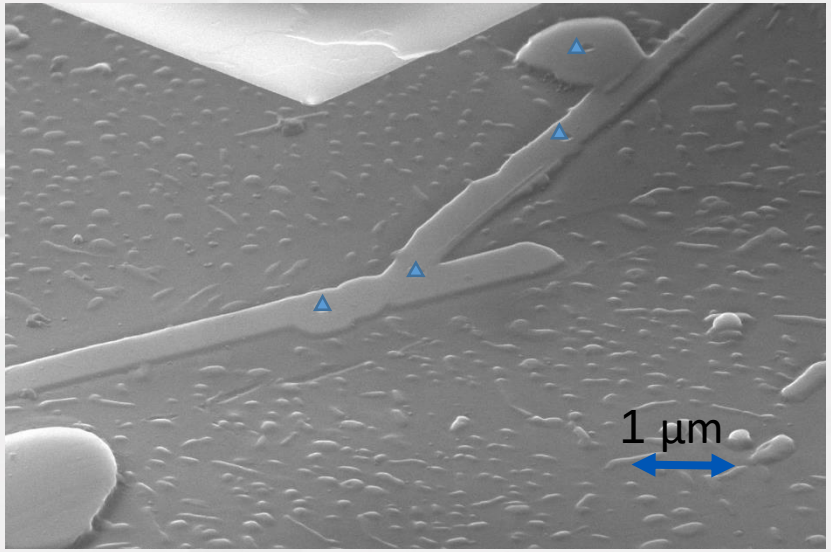
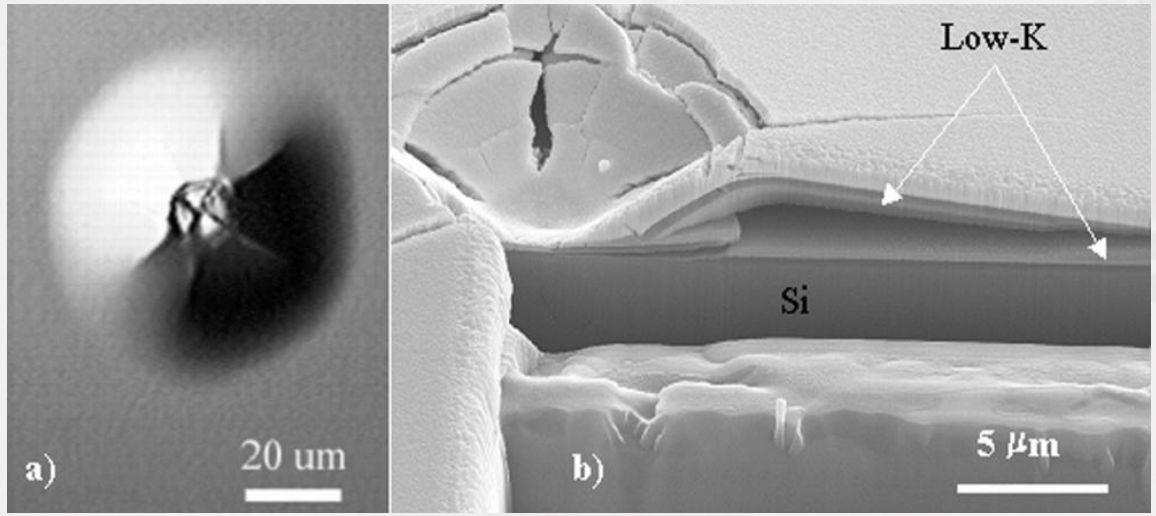
Why Test at Nanoscale?



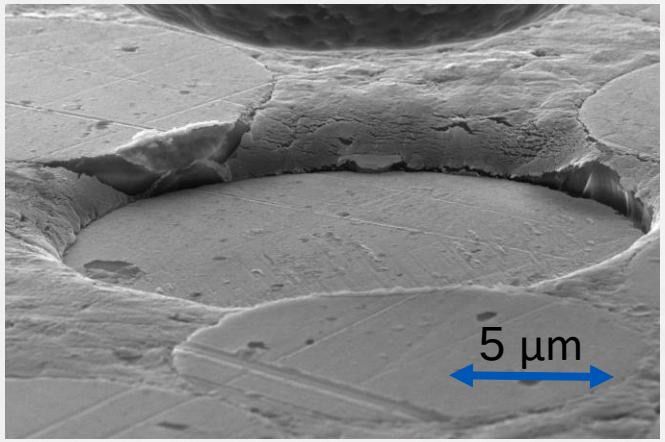
Small Feature Position Accuracy

Carbide Inclusion - Steel



Thin film characterization

Cohesive fracture – Thin ULK film



Depth and Load Control

Glass Fiber Matrix

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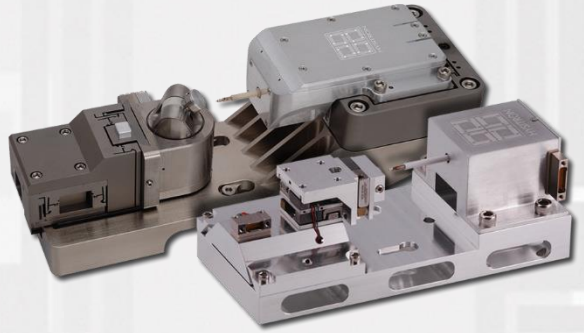
Hysitron® Instruments

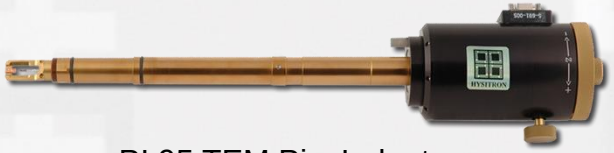
ATI-8800

TI 950
TriboIndenter

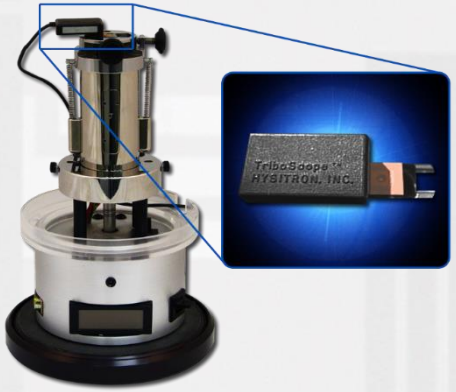
TI Premier



PI 87/85 SEM PicoIndenter



PI 95 TEM PicoIndenter



TS 75 TriboScope

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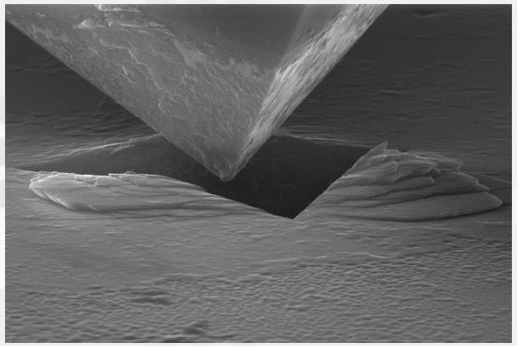
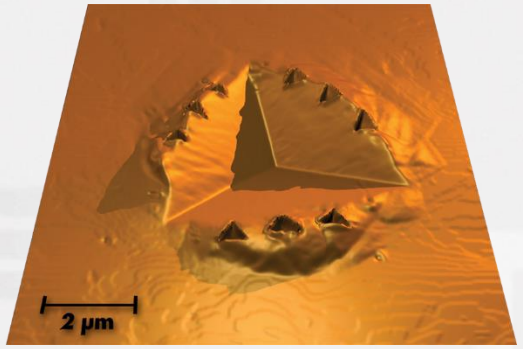
Testing Techniques

Nanoindentation

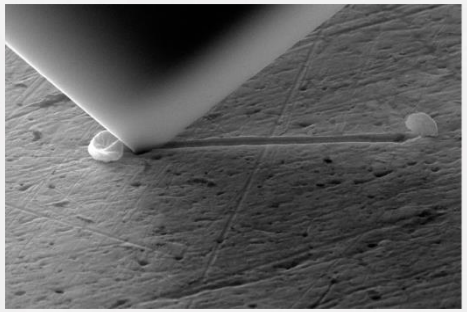




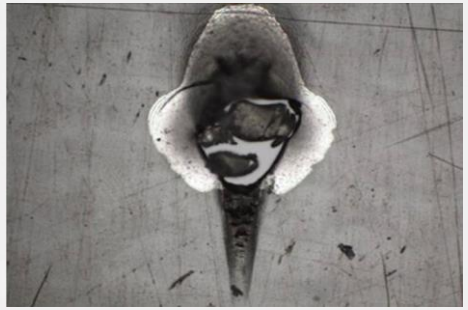
Hardess, Modulus, Dynamic

Tribology

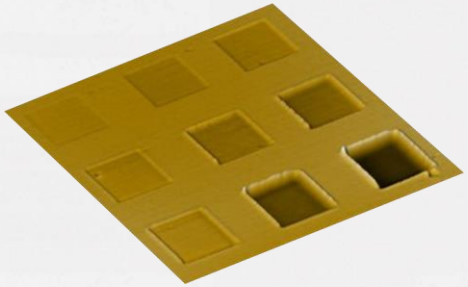
Scratch



Adhesion

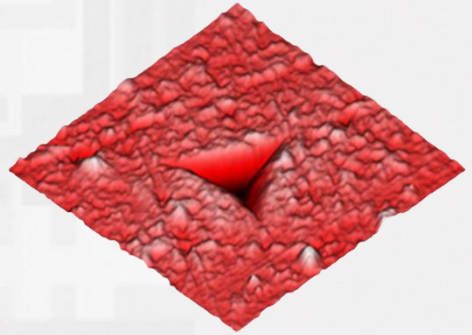


Wear

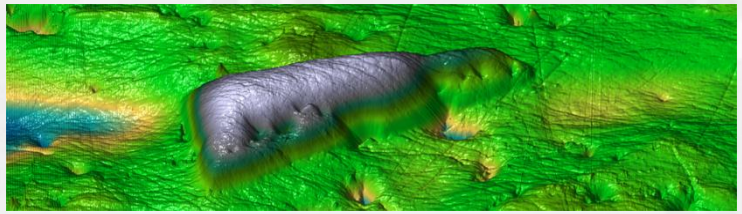


SPM Imaging

Surface Roughness



Positioning



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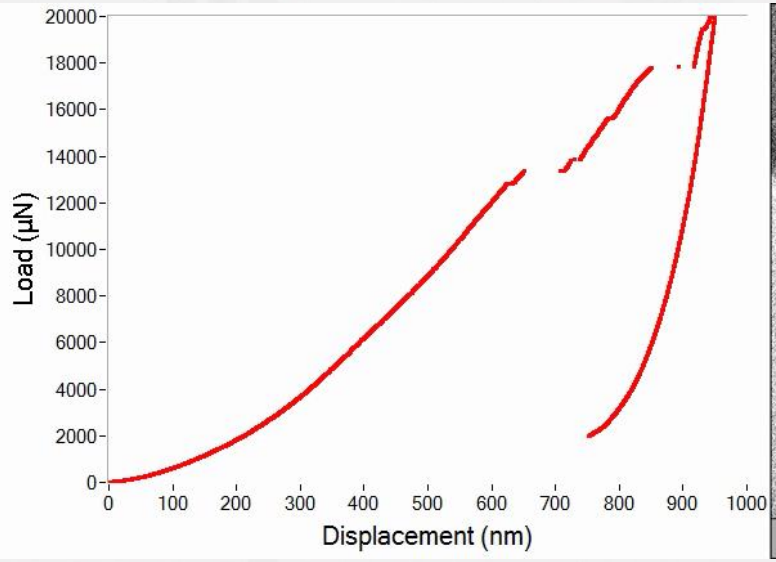
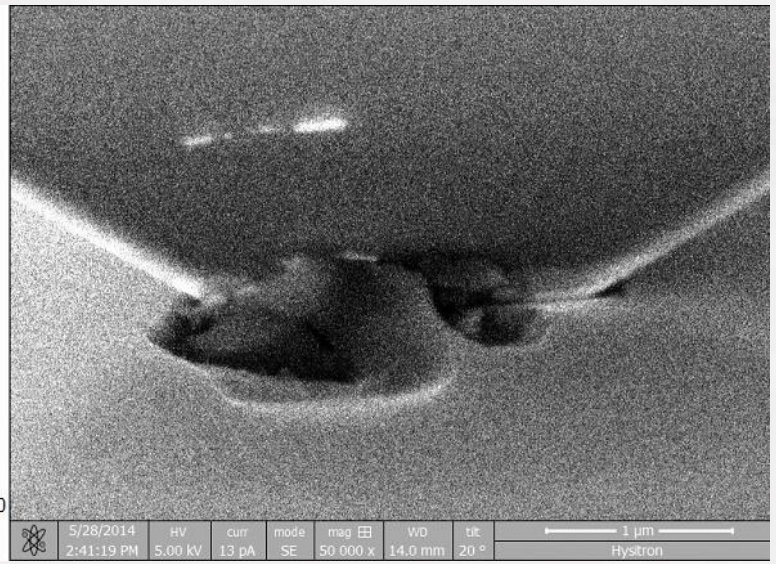
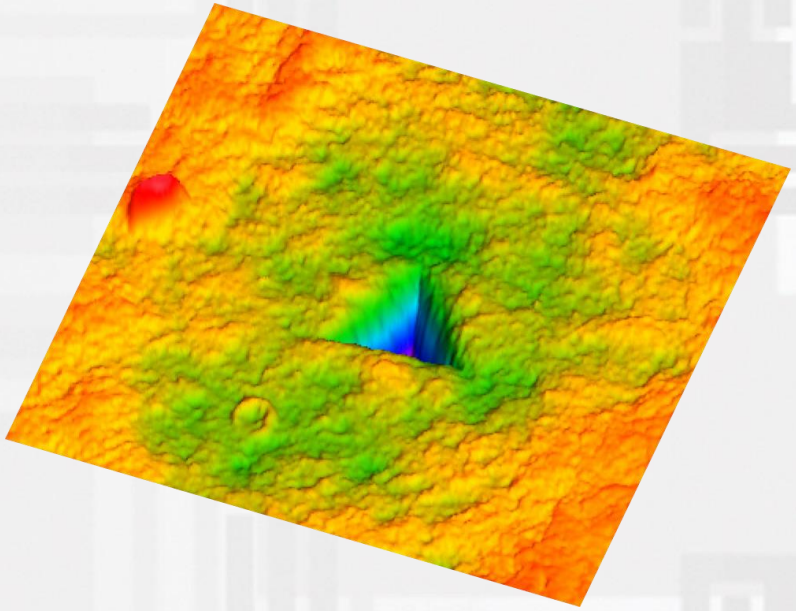
Nanoindentation







Applications

Hardness – Reduced Modulus –
Fracture Toughness

SPM imaging

Metal alloy– NiTi

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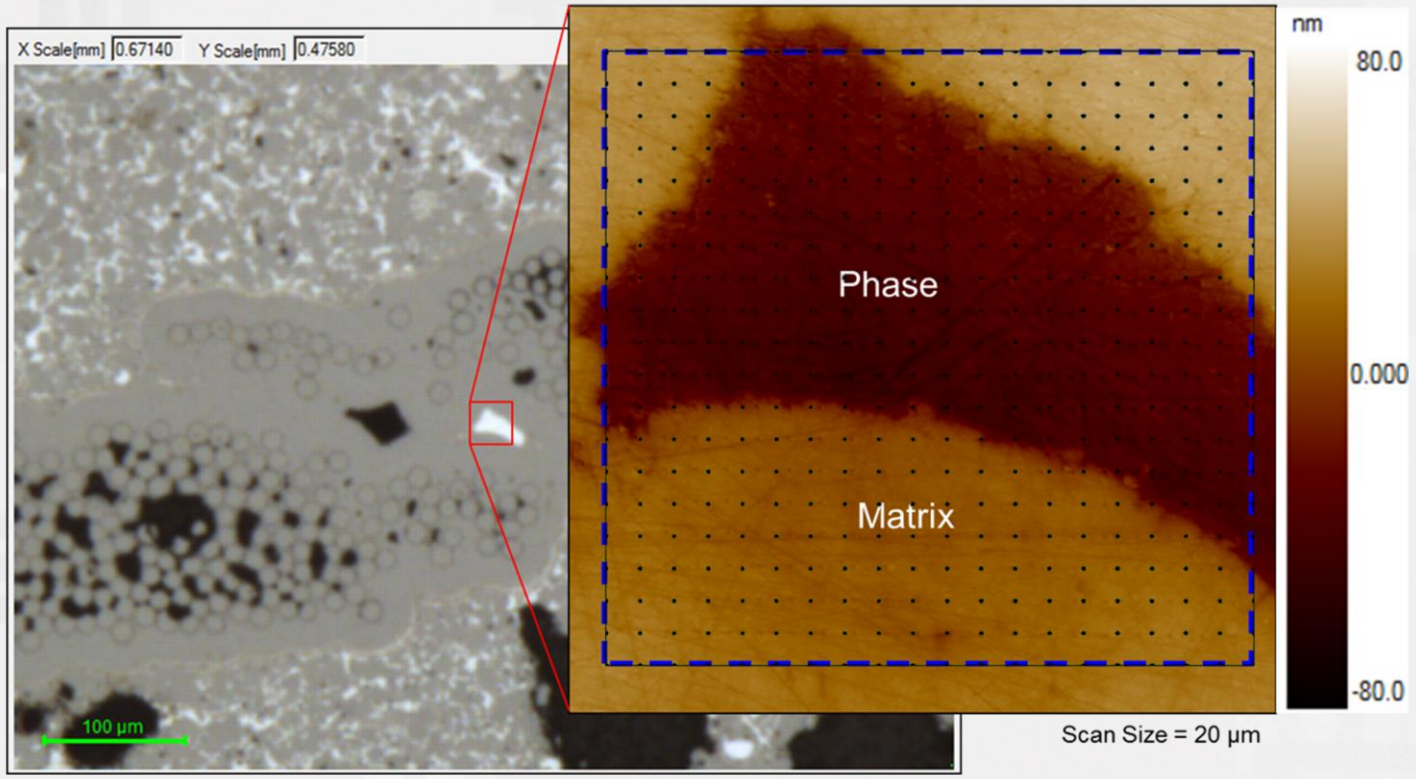
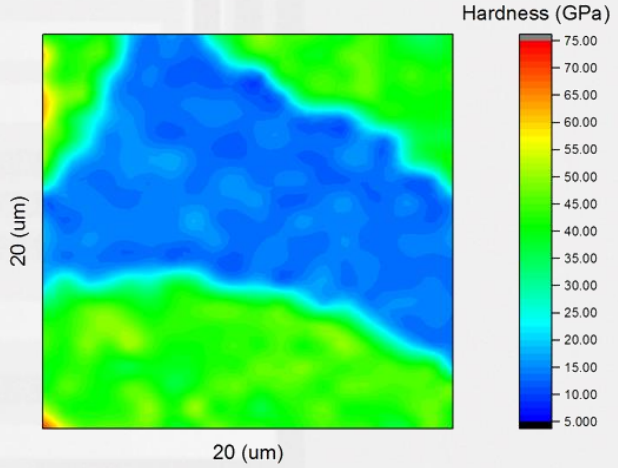
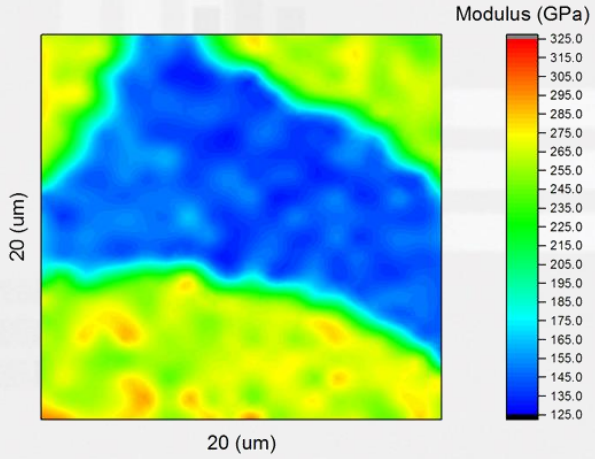
High Throughput Nanoindentation - XPM

20 x 20 XPM Nanoindentation Grid

400 indents in roughly 100 seconds







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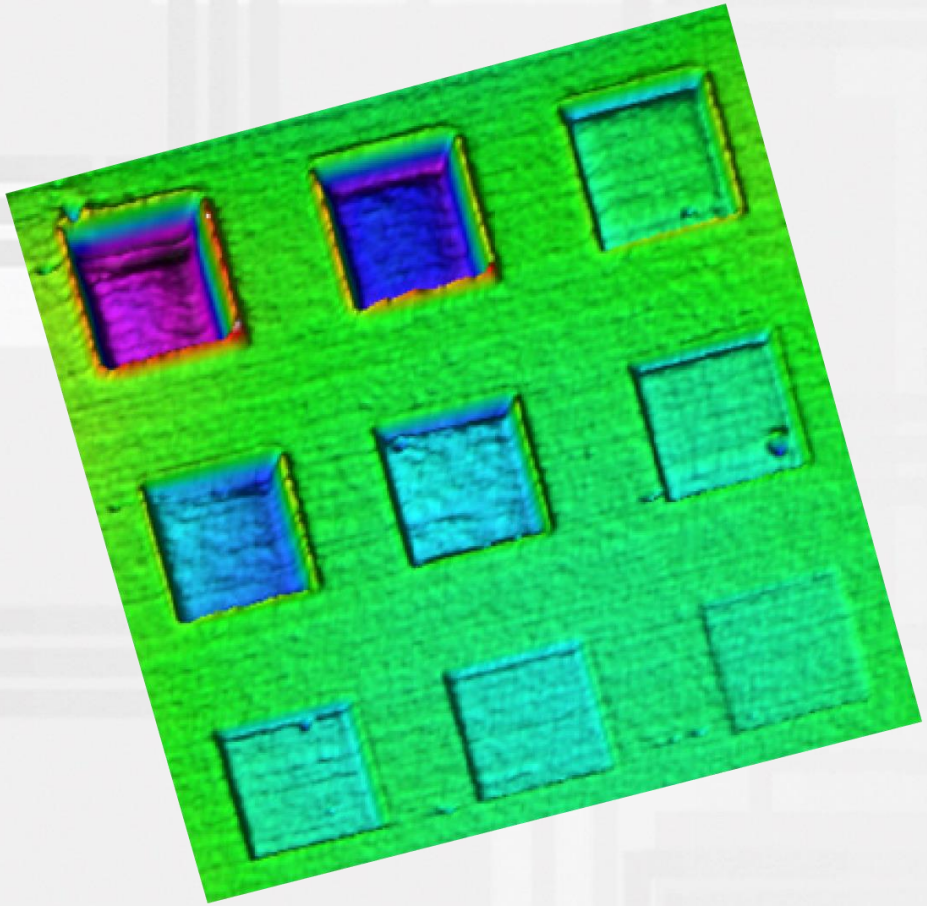
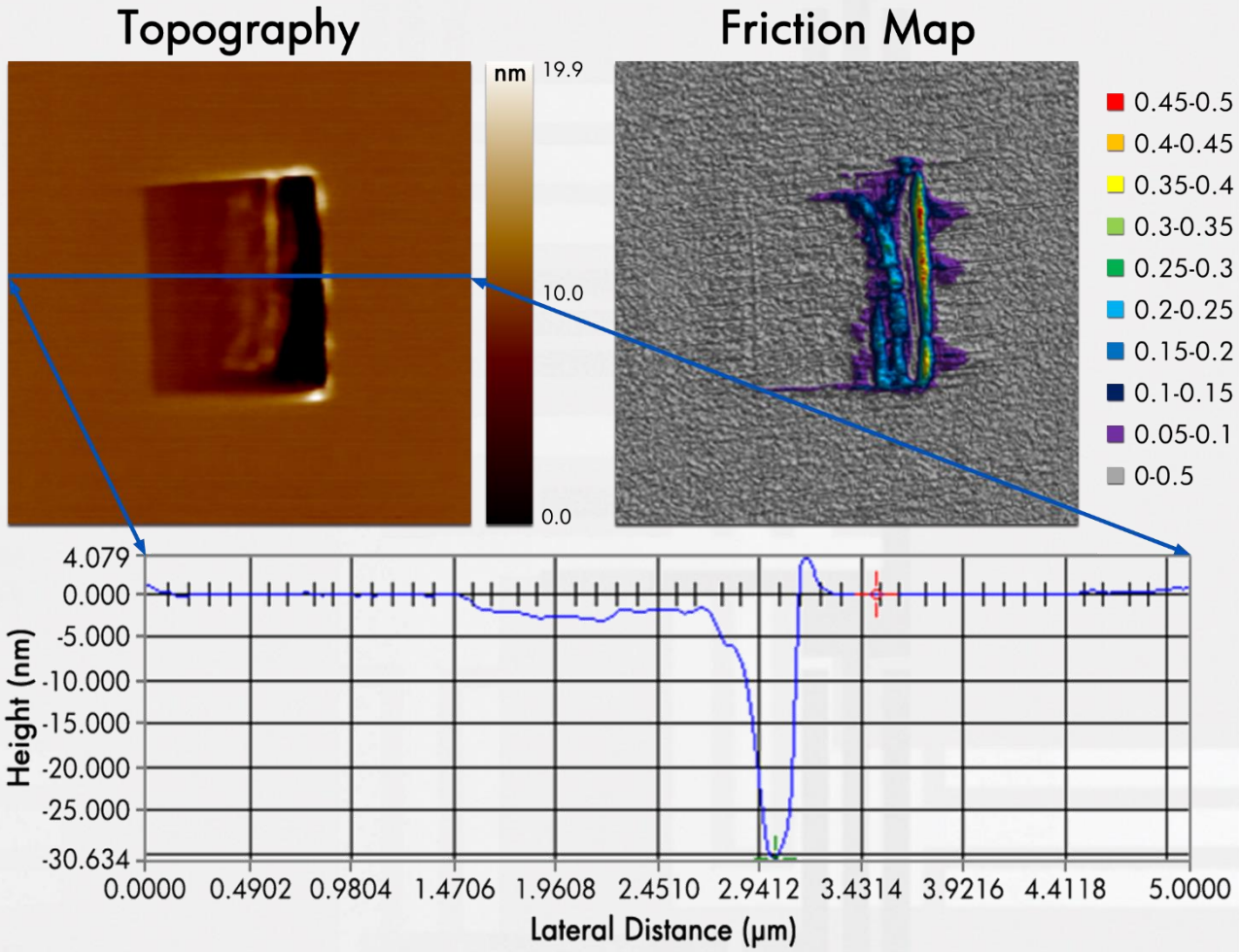
Optical – SPM – XPM Indentation

Ceramic Matrix Composite – SiC/SiC

Nanowear





Ramped wear test

Thin film – DLC coating

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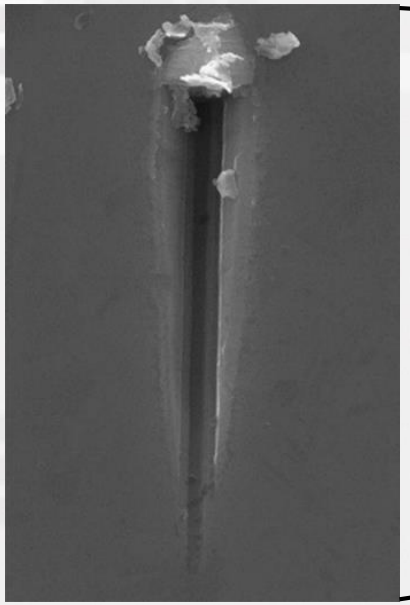
Nanoscratch

Applications

Scratch Resistance – Film
Adhesion – Coefficient of Friction



SEM image of the nanoscratch

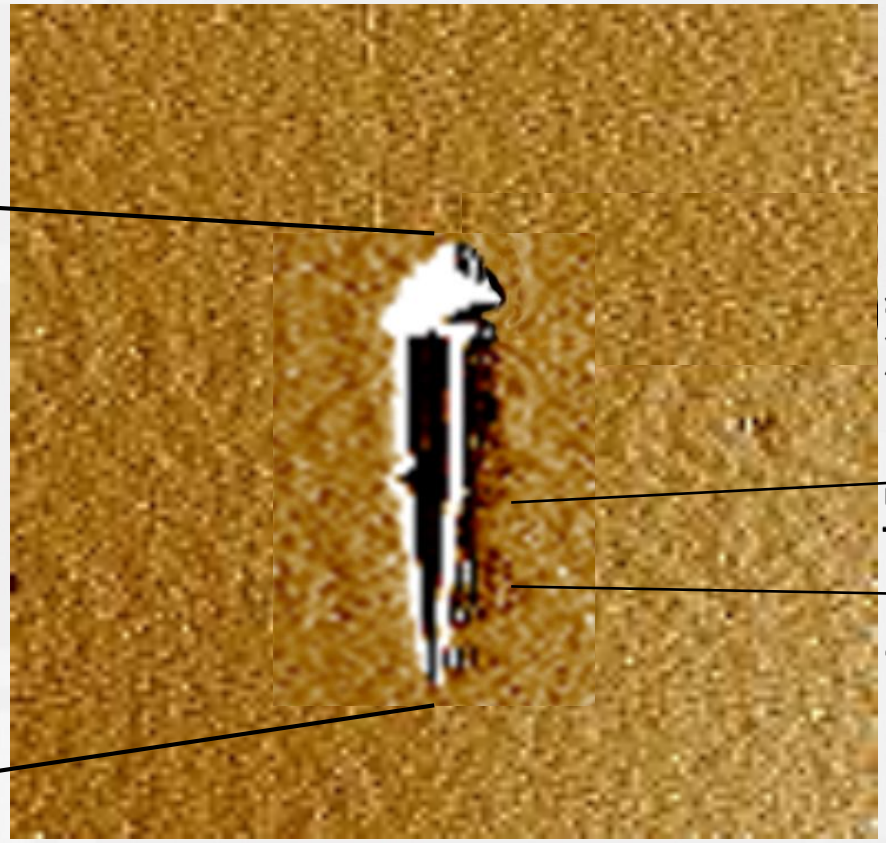
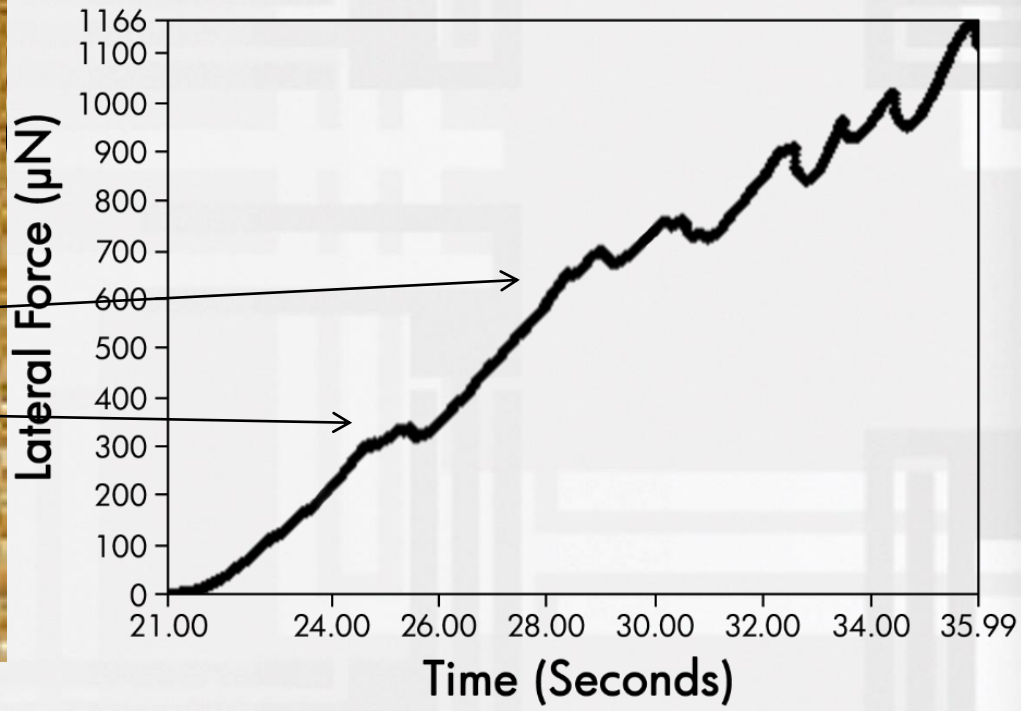


Image Scan Size: 20 μm

SPM image of a nanoscratch



Lateral force signal during the scratch

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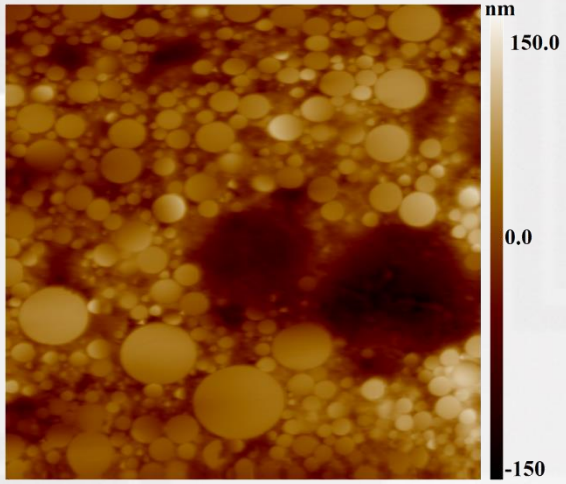
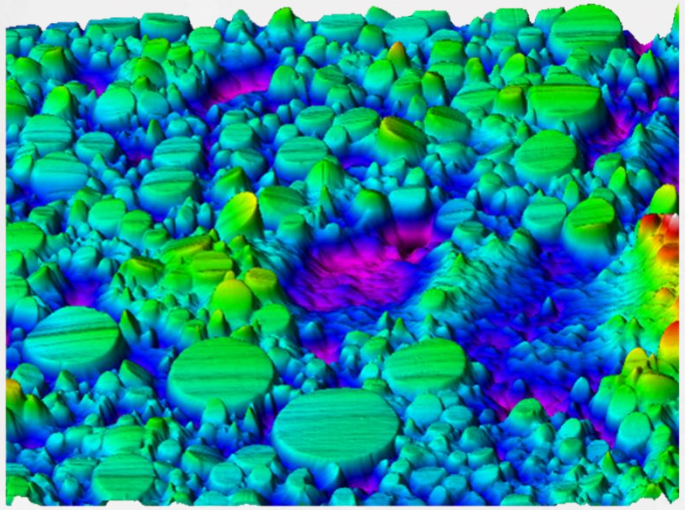
SPM Imaging



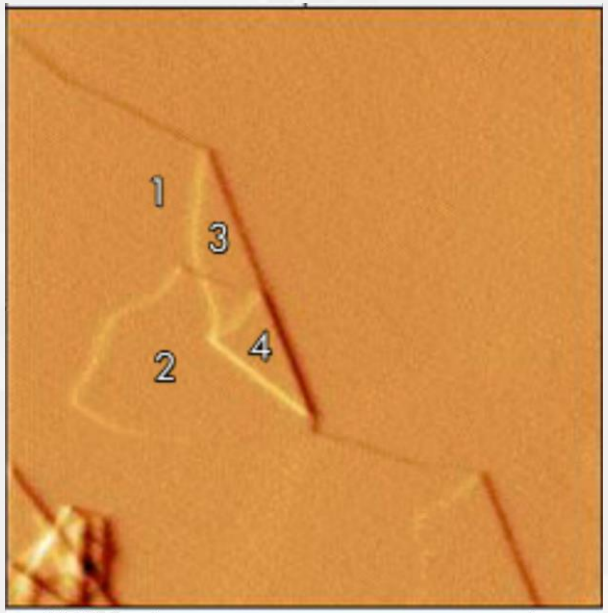
40 x 40 µm SPM Image

Glass Beads in Polymer Matrix



3D Image

Glass Beads in Polymer Matrix



1 x 1 µm SPM image

Graphene sheet

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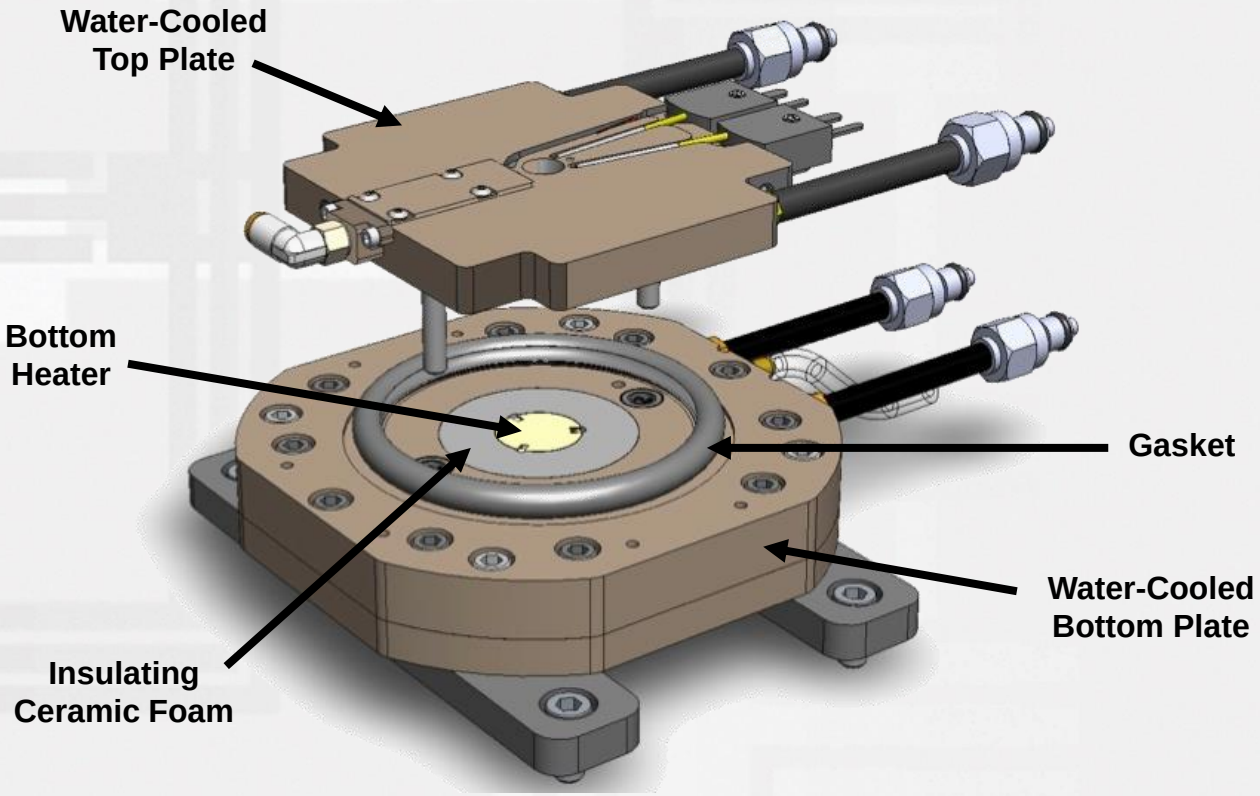
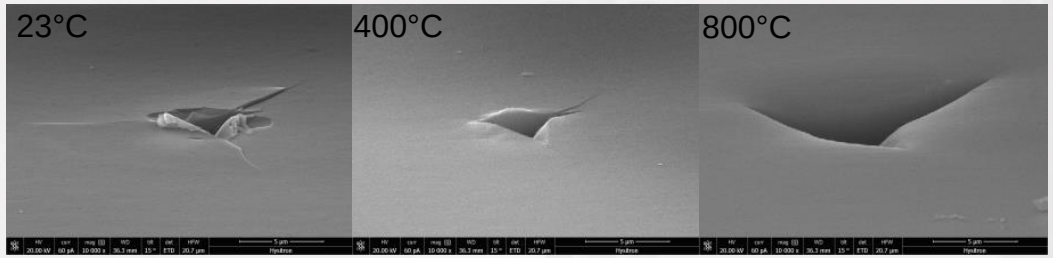
Environmental Control



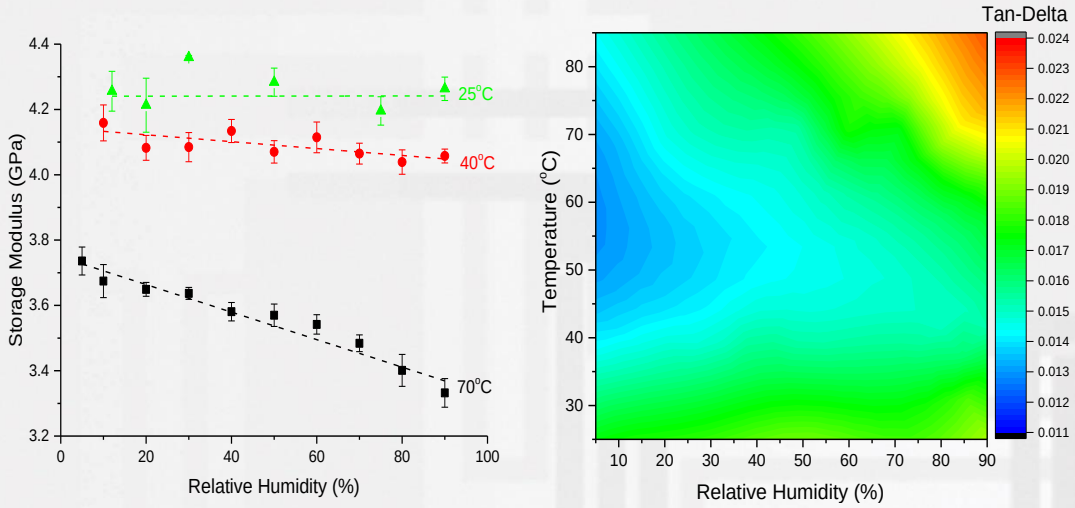
xSol – Heating, Cooling, Humidity

Heating to 800 C, Cooling to -100 C, Humidity to 95% RH



High Temperature Ductile Transition

Nanoindentation in Silicon



High Temperature High Humidity Mechanical Properties

Nanoindentation on Cellulose Acetate

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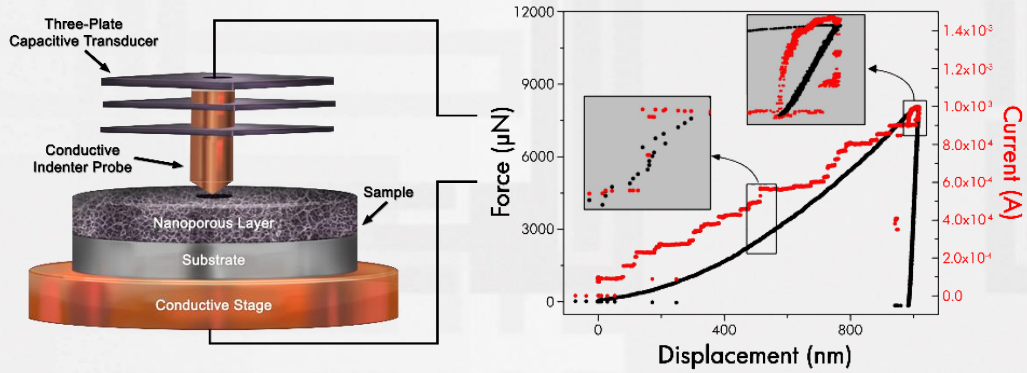
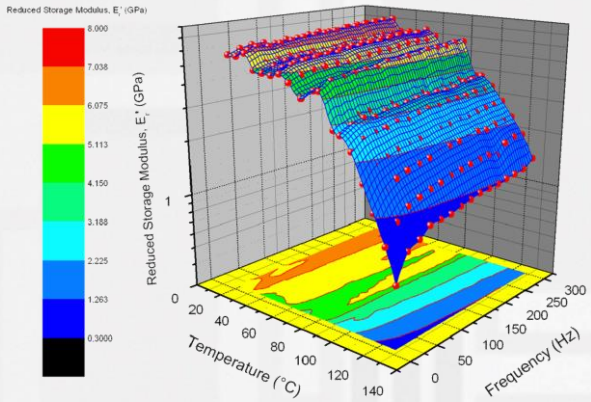
Additional Techniques

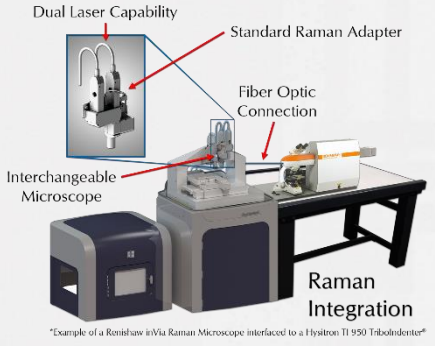
- *nanoECR*
  - *Mechanical + Electrical Characterization*

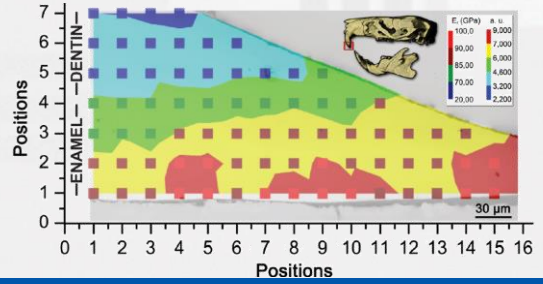


- *nanoDMA III*
  - *Viscoelastic Properties, Creep and Depth Profile*



- *Mechanical + Raman*
  - *Chemical Analysis and Residual Stress Measurement*





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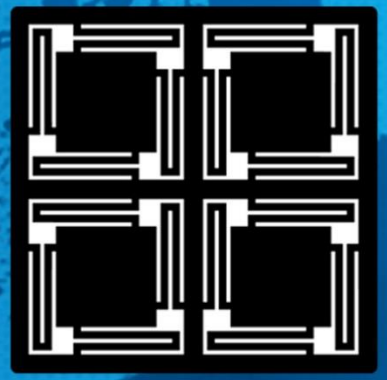

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NANOMECHANICAL TEST INSTRUMENTS

Thank You!