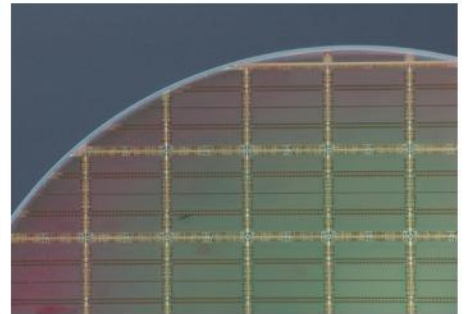
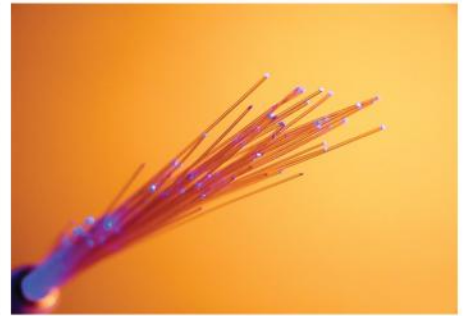
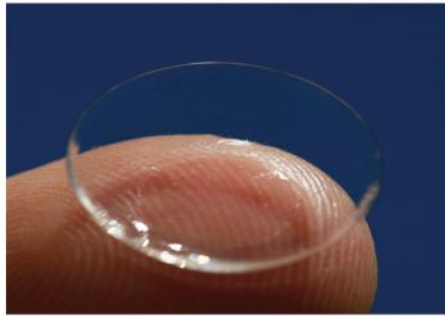




Micro Photonics

The leading source for advanced instrumentation for industrial and scientific research.

Nano Mechanical Instruments *Hardness & Scratch with IBIS Technology*

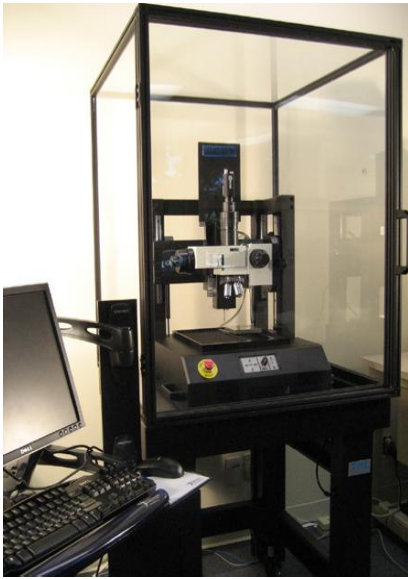


***Exclusive technology for advanced
nano mechanical research***

NANOVEA™
Series



Nanovea® Nano Mechanical Instruments



Introduction

Nanometer-scale industrial coatings demand ultrahigh resolution indentation and scratch testers capable of accurately characterizing very thin layers of material. Examples include thin DLC overcoats used in the magnetic hard disk industry and varnish clearcoats such as those used in the automobile industry.

Nanovea® Nano Mechanical Instruments are high precision instrument for the determination of the nano mechanical properties of thin films

and layers using [instrumented nano-indentation and nano scratch/adhesion testing](#).

The Nanovea Platform is equipped with a full video microscope, and motorized Z approach of more than 50mm and a gas spring slide for a maximum clearance of 140mm. The Platform has been built to incorporate in addition to the Nano Module described here, the Micro Module, the AFM Microscope Objective and the Optical Profiler.

Nano-Indentation Tester

The Nanovea Nano-Indentation & Nano Scratch Tester was developed, with the collaboration of renowned nano-mechanical expert, Dr. A.C. Fischer-Cripps. The Nano-Indentation Module is designed with high quality workmanship for longevity and accurate, repeatable results.

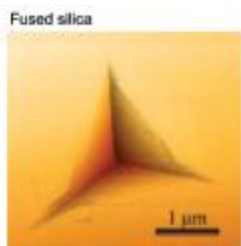
The Nano-Indentation Tester can quickly determine, at very low loads, properties such as hardness and Young's modulus on any type of material - soft, hard, brittle, or ductile.

Instrumented Indentation Principle

An indenter tip, Berkovich, Vickers, Sphero-conical, Knoop or Cube-corner, is driven into the sample by applying an increasing load to some preset value. The load is then gradually decreased until partial, or complete, relaxation of the sample has occurred. The load and displacement are recorded continuously throughout this process to produce a load-displacement curve. Adding a pause at maximum load allows to study creep properties.

Calculates the Following Properties

- Hardness,
- Young's modulus
- Creep measurement
- Stress-strain studies
- Fracture toughness
- Plastic and elastic energy
- Storage & Loss Moduli
- Complex viscosity



Why is Nanovea Technology Different?

Only Nanovea with IBIS Technology has independent force and depth sensors which are separately calibrated using equipment traceable to mass and length standards.

Most competitors use a capacitance gauge as the depth sensor and apply the load using an increase of current in an electro-magnet instead of a force sensor. The trouble is that the deflection of the indenter support springs also consumes current, and this has to be subtracted off, so you are left with the current needed to actually cause the penetration. This method is cheap, and prone to drift and errors. The current calibration is made one time at manufacture and cannot be verified easily. Nanovea is the only system equipped with a load cell that continuously measure the real 100% applied load.



Standard specimens are also used to verify the operation of the instrument. Assessing the instrument performance using two materials, such as fused silica and sapphire, is necessary to verify functioning across the usual range of interest of modulus and hardness in nano-indentation testing.

Only the Nanovea Nano-Indentation Tester offers breakthrough multi-frequency indentation testing. Fourier analysis separates the frequency-dependent storage, loss moduli and complex viscosity of the specimen. A single frequency estimation, produced by conventional dynamic indentation methods, only provides one data point in a spectrum of material responses. With a low frequencies 0.1 to 20Hz (higher frequencies also available), the Nanovea's stroboscopic nano-indentation studies are an essential tool for those researching visco-elastic deformation of materials, such as plastics and polymers, as a function of frequency.

Nano Scratch Tester

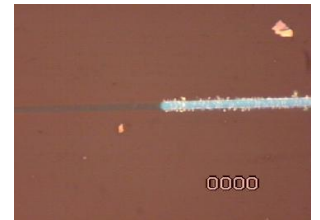
The Nanovea Nano Scratch Tester exploits a normal force range to 500 mN and is well suited for adhesion failure studies of thin films. With its long scratch path and very precise load control, the Nanovea Nano Scratch Tester is an important tool for the study of crack initiating and marring applications on all kinds of polymers such as varnish clearcoats used in the automobile industry.

Scratch Testing Process

During the test, a sharp metal tip or a Rockwell C diamond is drawn across the coated surface with an increasing load resulting in various types of failure at specific critical loads. Critical loads are identified optically using a built-in video microscope. Once known, these critical loads are used to quantify the adhesive and cohesive properties of different film/substrate combinations. Additionally, failure points can be determined by using frictional force, optional acoustic emission and depth measurement. These parameters constitute a unique signature of the coating/substrate system.

Properties Analysed

- Types of failure
- Adhesion Strength
- Friction Coefficient
- Marring and Cracking
- Wear Reciprocating
- Plastic & Elastic Deformation

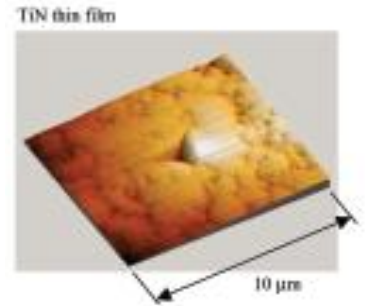


AFM Objective

An Atomic Force Microscope Objective can be added to the optical microscope to allow a whole new range of capabilities with the Nanovea Nano-Indentation and Nano Scratch Tester. This AFM Objective gives access to the most accurate determination of contact area as well as to high resolution images, providing valuable information about the modes of deformation such as pile-up, cracking, delamination, slip bands and other characteristics of failure around the indents.



Unlike other AFM objectives, the DualScope AFM avoids actual contact with the sample surface yet presents a very accurate image (to the <math><1\text{ nm}</math>) of the surface topography.



Options

A heating/cooling plate is available for temperature studies (-120 °C to 400 °C). Choose from various sample holders and a wide range of indenters: Cube-corner, Berkovich, Vickers, Sphero-conical and Flat-end. An Ergonomic Anti-vibration table with enclosure is available.

Nanovea IBIS Nano Indentation & Scratch Tester Software

The IBIS Nano Indentation & Scratch Tester Software offers the traditional Oliver & Pharr method of analysis with a powerful non-linear solver for fitting the unloading curve (effective indenter shape). Both quasi-static and multiple-frequency dynamic test data can be analyzed. The scratch testing section of the software controls test parameters such as: speed, loading rate and scratch length, as well as analyzing test results.

Nano-Indentation

- Images of indents from color camera
- Completely flexible test specifications, includes also standard tests meeting ISO 14577
- Analysis of data from Berkovich, Vickers, Sphero-conical and Cube-corner indenters
- Multi-frequency Fourier-transform dynamic testing
- Automatic calculation of hardness & elastic modulus & data averaging
- Simulated curve based upon user inputs of estimated modulus and hardness
- Creep (constant force) with iterative solving for up to 4-element Maxwell - Voigt model
- Elastic-Plastic material properties with strain hardening
- Positioning of each indent with the microscope
- User-friendly
- Optional coating geometry
- Force rate, strain rate control
- Mapping of indentation
- Precise relocation of each indent
- Powerful finite element analysis module (optional)
- Export in ASCII format

Scratch Testing

- Real time display of Depth, Frictional Force versus Load (or Displacement)
- Images incorporated directly into the scratch file for easy reference
- On-line correlation between measured data and optical observation
- Associated load automatically indicated on the picture for easy identification
- Multi-pass scratch testing for the characterization of the wear properties of the coating
- Constant and progressive loads
- Control of all Scratch parameters including Speed, loading rate and scratch length
- Zoom Functions
- Data export in ASCII format
- Latest Windows OS software
- User-friendly w/ free software updates



Nano-Indentation & Nano Scratch Tester

Automatic Z Approach • Multi-Frequency Indentation Technology • Closed Loop Force Feedback
AFM For High Resolution Imaging • High Accuracy • Fast Measurement

MODEL		NANO INDENTATION-SCRATCH TESTER
Load Range	50mN & 500mN auto-ranging	
Load Resolution (Theoretical)	0.08 μ N	
Load Resolution (Noise Floor)	1 μ N	
Depth Resolution (Theoretical)	0.003nm	
Depth Resolution (Noise Floor)	0.05nm	
Friction Force Max	150mN, 15mN	
Friction Noise Floor Resolution	0.6 μ m	
Frequencies	0.1 to 20Hz (High Frequencies Optional)	
Scratch Length w/Visual Inspection	90 mm	
Scratch Length w/o Visual Inspection	150 mm	
X & Y Stages	150 mm	
X, Y Lateral Resolution	10nm	
X,Y Lateral Accuracy	50nm	
Z Motorized Range	50 mm	
Z Maximum Clearance	140 mm	
Scratch Speed	0-240 mm/min	
Base Dimensions	52 x 56 x 86 cm	
Video Microscope Magnification	100x, 500x, 1000x (50x, 200X opt.)	

APPLICATIONS

STANDARDS

Semiconductor Technology

Passivation Layers
Metallizations
Bond Pads

Wear Resistance Coatings

TiN, TiC, DLC
Cutting Tools

Mass Storage

Coating on Magnetic Disks
Coatings on Disk Substrates
Protective Coatings on CDs

Scratch Testing

ASTM G7187
ASTM D7027
ASTM D1624
ASTM C171

Pharmacological

Tablets, Pills
Implants
Biological Tissue

Optical Components

Contact Lenses
Eye Glass Lenses
Fiber Optics
Optical Scratch Resist

Automotive

Paints & Polymers
Varnishes & Finishes
Windows

ISO 20502
ISO 1518

Instrumented Indentation

ISO 14577
ASTM E2546

General Engineering

Rubber Resistance
Touch Screens & Coatings

MEMS

MicroElectroMechanical Systems

Decorative Coatings

Evaporated Metal Coatings



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