LOTUS

About Company

Lotus Intelligent Micro/Nano Sensors (IMNS), established in 2018, is a pioneering knowledge-based company specializing in the development and manufacturing of advanced electronic micro/nano sensors, microneedle patches, and high-precision fabrication equipment.

IMNS is recognized as a regional innovator in dissolving microneedle technologies, bringing advanced drug delivery solutions while contributing to the global progress in pharmaceutical and biomedical innovation.

What sets IMNS apart is its ability to develop in-house know-how. From the ground up, we have designed and built our own fabrication equipment — lithography, thin-film deposition, and etching systems — and used them to create complete micro/nano fabrication processes. With these technologies, we have successfully produced microelectronic sensors at wafer scale (4-inch) — a major achievement accomplished under limited resources and challenging conditions.

This capability reflects not only the strength of our technical team but also the vision of our founder, Dr. Milad Gharooni, whose background in nanoelectronics research and development has shaped IMNS into a company capable of delivering innovation at global standards. In recent years, Mr. Hamid Eslam has also joined IMNS, contributing his expertise in financial management to support the company's sustainable growth.

The name "Lotus" reflects our cultural roots: the lotus flower, a symbol of peace during the reign of Darius the Great, embodies resilience, harmony, and growth. Inspired by this legacy, our logo and vision unite heritage with high technology.

Guided by our motto, "Sense Your Ideas," we are committed to transforming innovative concepts into cutting-edge products that empower industries and improve lives worldwide.

Our Team Story

IMNS was founded with a bold vision: to transform scientific knowledge into practical technologies.
What began as a small team of passionate researchers in micro/nano systems has grown into a company that not only manufactures advanced products but also develops the very tools required to build them.
Unlike many companies that rely on imported technologies, we achieved the rare milestone of creating both the fabrication equipment and the microelectronic processes in-house. By developing lithography, deposition, and etching systems ourselves — and applying them to design and fabricate sensors at the wafer scale — we have proven that even with limited resources, breakthrough innovation is possible. Many have described this accomplishment as nothing short of extraordinary in the context of our region.
In 2024, as part of our global expansion, we registered a Canadian subsidiary. Today, we are preparing for our next transformative chapter: relocating our headquarters to Dubai. With Dubai's unparalleled infrastructure, visionary leadership, and commitment to emerging technologies, we believe our proven expertise can scale rapidly and create significant global impact.
Our journey has always been guided by three principles:

- Innovation – pushing the boundaries of micro/nano science.
- Quality – ensuring global standards at every step.
- Impact – enabling technologies that improve lives and industries.

IMNS is more than a manufacturer; it is a creator of knowledge, tools, and technologies. With the right ecosystem — one that Dubai is uniquely positioned to provide — we are ready to take the next leap forward and redefine what is possible in the deep-tech landscape.

Product Categories & Roadmap

	Micro/Nano Fabrication Systems	Nano Coating and Surface Engineering Systems	High-Precision Micro/Nano Sensors	Healthcare & Life Science Devices
Available Products	ICP-DRIE Diffusion and Oxidation Furnace Mask Aligner Magnetron Sputtering Thermal Evaporation Reactive Ion Etching	Arc PVD / Cathodic Arc Deposition	AFM Tip Thermal Conductivity Detector (Micro-TCD) Micro-GC Column MEMS Inertial Sensors	Microneedle Patch Biosensors Lab on a chip
Upcoming Products	LPCVD & PECVD Mask Writer Wafer & Wire bonder Automated DUV Stepper Microscopic equipment & tools EBL & FIB Ion Implanter MBE, MOCVD & ALD	Magnetron Sputtering Roll-to-Roll Coating Systems Chemical Vapor Deposition (CVD) Systems	Gas flowmeter MEMS Micro Switches Car sensors Pressure Sensors Metal Oxide Gas Detectors Advanced Gas sensors	Novel blood sugar controlling system Novel blood test subsystems Neural probes Online health monitoring sensors & systems

Emerging Technologies:

Energy Devices
Environmental Monitoring & Treatment Systems
Smart Technologies & AI
Next-Generation Microchip Manufacturing Lines

Oxidation and

Diffusion Furnace

Oxidation and Diffusion Furnace

Our furnace is designed to perform oxidation & diffusion process on a 4inch silicon wafer.

Oxidation Furnaces

Oxidation is the groundwork for all of the semiconductor fabrication processes. The oxidation process creates an SiO2 layer, which serves as an insulating layer that blocks leakage current between circuits. The oxide layer also protects the silicon wafer during the subsequent ion implantation and etching processes. In other words, the silicon dioxide layer serves as a reliable shield during the semiconductor manufacturing process. Thermal oxidation can be either wet or dry, depending on the gas used for the oxidation reaction. Dry oxidation uses pure oxygen (O_2), and consequently, the oxide layer grows more slowly, making it ideal for creating a thin layer. Oxides created by the dry method have excellent electronic properties. Wet oxidation uses both oxygen (O_2) and vapor (H_2O) As a result, the oxide layer grows faster and forms a thicker layer. However, oxides created by the wet method are not as dense as those created by dry oxidation. Under identical time and temperature conditions, the oxides formed by the wet method are about five to ten times thicker than those formed by the dry method.

Diffusion Furnaces

In semiconductor production, doping is the intentional introduction of impurities into an intrinsic (undoped) semiconductor for the purpose of modulating its electrical, optical and structural properties. The doped material is referred to as an extrinsic semiconductor.

Feature and benefit

- 1100°C Precision – Highest operating temp in class for advanced SiO_2 growth & doping.
- 6-inch Tube Compatibility – Processes 4" wafers with room for R&D customization.
- 3-Zone Smart PID – ±1°C uniformity via independent/master-slave control.
- Siemens PLC Automation – Full recipe control for unattended 24/7 operation.
- Optional Water Cooling – Enables rapid cooldowns (30% faster cycle times).
- 4-Tube Stack Design – Run oxidation, doping, and annealing simultaneously.
- Zero Cross-Talk – Isothermal chambers prevent thermal interference.
- Contactless Loading – Automated boat-in-tube reduces contamination risk.

Wafer size	100mm, 75mm or any custom size
Wafer load	FP: +100 RD: 25 to 50 (typical)
Heating system	3 or 5 Zone
Flat zone	FP: up to 750 mm (30") RD: down to 300 mm (12") ± 1°C across flat zone
Process temperature	Up to 1100°C
Power supply	2 to 5 line with 220V, 40A, 50 or 60Hz
Options	wafer handling automation Wafer gripper Water cooling system

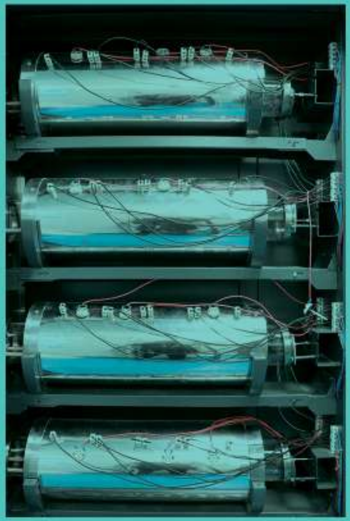
Furnace structure

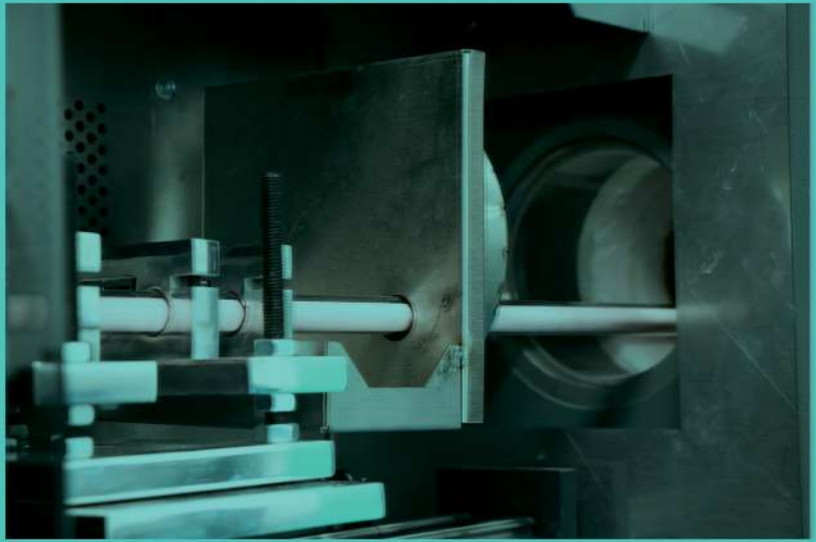
1 Dry oxidation Furnace

2 Wet oxidation Furnace

3 Phosphorous Diffusion Furnace

4 Boron Diffusion Furnace





Deep Reactive Ion Etching

Deep reactive ion etching (DRIE) is a type of reactive ion etching aimed at creating very deep, high aspect ratio structures. While a standard RIE process can be used, they are often inadequate so a couple of variations have been developed for specific applications. The most common variant is the Bosch process, used mainly for etching silicon substrates. It is also possible to use cryogenic etching to create a high aspect ratio etch in silicon, compound semiconductors, and some polymers. It was developed for microelectromechanical systems (MEMS), which require these features, but is also used to excavate trenches for high-density capacitors for DRAM.

The Bosch process, named after the German company Robert Bosch GmbH which patented the process, also known as pulsed or time-multiplexed etching, alternates repeatedly between two modes to achieve nearly vertical structures:

- A standard, nearly isotropic plasma etch. The plasma contains some ions, which attack the wafer from a nearly vertical direction. Sulfur hexafluoride [SF6] is often used for silicon.
- Deposition of a chemically inert passivation layer. (For instance, Octafluorocyclobutane [C4F8] source gas yields a substance similar to Teflon.)

Each phase lasts for several seconds. The passivation layer protects the entire substrate from further chemical attack and prevents further etching. However, during the etching phase, the directional ions that bombard the substrate attack the passivation layer at the bottom of the trench (but not along the sides). They collide with it and sputter it off, exposing the substrate to the chemical etchant. These etch/deposit steps are repeated many times over resulting in a large number of very small isotropic etch steps taking place only at the bottom of the etched pits. To etch through a 0.5 mm silicon wafer, for example, 100–1000 etch/deposit steps are needed. The two-phase process causes the sidewalls to undulate with an amplitude of about 100–500 nm. The cycle time can be adjusted: short cycles yield smoother walls, and long cycles yield a higher etch rate.

Deep Reactive Ion Etching

Feature and benefit

Lotus Deep Reactive Ion Etch (DRIE) is tool used to etch 4" (100 mm) silicon wafers using the Bosch process. It has a high power ICP source and is capable of fast, high aspect ratio anisotropic etching of silicon. Fast-acting, high precision MFCs and pendulum valve and a turbo pump provide fast switching times, enabling reduced undercut and sidewall roughness. Etch rate varies with feature size and density, so a characterization run is strongly recommended with any new mask.

Technical data	
Control	PLC
RF Power	300 W for CCP, 2000W for ICP
Wafer size	4-inch wafer
Process Pressure	0.05-10 Torr
Base Pressure	1x10-5 Torr
Gases	SF6, C4F8, Ar, O2
Gas Distribution	Shower Head, MFC's, SS lines

- High etch rates are achieved by high ion density and high radical density
- Control over selectivity and damage is achieved by low ion energy
- Separate RF and ICP generators provide separate control over ion energy and ion density, enabling high process flexibility
- Low pressure processing yet still high density for improved profile control
- Chemical and ion-induced etching
- High conductance pumping port provides high gas throughput for fastest etch rates Wafer clamping and cooling as standard, providing excellent temperature control

RF-Sputtering

Sputter deposition is a physical vapor deposition (PVD) method of thin film deposition by sputtering. This involves ejecting material from a "target" that is a source onto a "substrate" such as a silicon wafer. In RF sputtering there are a cathode (the target) and a anode, in series with a blocking capacitor (C). The capacitor is part of an impedance-matching network that proves the power transfer from the RF source to the plasma discharge. The power supply is a high voltage RF source often fixed at 13.56 MHz. The blocking capacitor C is placed in the circuit to develop the all-important DC self-bias, and a matching network is utilized to optimize power transfer from the RF source to the plasma. RF-sputtering offers advantages over DC; in particular sputtering of an electrically insulating target become possible.One of the earliest widespread commercial applications of sputter deposition, which is still one of its most important applications, is in the production of computer hard disks. Sputtering is used extensively in the semiconductor industry to deposit thin films of various materials in integrated circuit processing. Thin antireflection coatings on glass for optical applications are also deposited by sputtering. Because of the low substrate temperatures used, sputtering is an ideal method to deposit contact metals for thin-film transistors. Another familiar application of sputtering is low-emissivity coatings on glass, used in double-pane window assemblies. The coating is a multilayer containing silver and metal oxides such as zinc oxide, tin oxide, or titanium dioxide. A large industry has developed around tool bit coating using sputtered nitrides, such as titanium nitride, creating the familiar gold colored hard coat.

RF-Sputtering

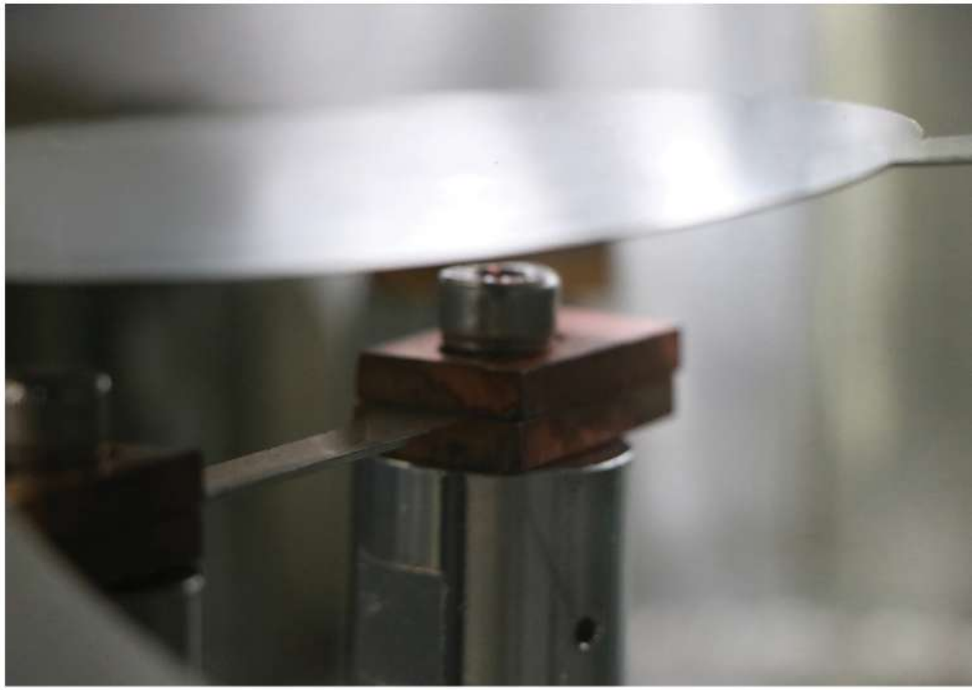
Feature and benefit

- Turbo molecular pump to provide fast and clean oil free high vacuum
- User friendly front panel color LCD based touch screen Siemens HMI control
- Siemens PLC based process automation with recipe
- Substrate heating facility up to 300°C
- Three different material can be deposited individually and at the same time
- Isothermal sample holder
- Full range pressure measurement
- Fully rotational stage design results in outstanding process control which guarantees superior uniformities.
- Recipe guarantee: offers starter recipes for every process utilizing its extensive library of process recipes.
- High resolution film thickness monitor
- Maintenance friendly mechanical design.
- Shutter Assembly for All Sources
- Mass Flow Controller based gas control system

Technical data	
Wafer size	Up to 100mm
Wafer number	5
Sputtering material	Au, Cr, Ni, Ag, Al, Si3N4, SiO2 ...
source	Three 600W RF generator
Process temperature	Up to 300^{0}C
Ultimate pressure	5 × 10-6
option	Graphite substrate heating system Wafer fully rotational stage

Thermal Evaporation System

Evaporation is a common method of thin-film deposition. The source material is evaporated in a vacuum. The vacuum allows vapor particles to travel directly tothe target object (substrate), where they condense back to a solid state. Evaporation is used in microfabrication, and to make macro-scale products such as metallized plastic film. Any evaporation system includes a vacuum pump. It also includes an energy source that evaporates the material to be deposited. In the thermal method, metal material (in the form of wire, pellets, shot) is fed onto heated semimetal (ceramic) evaporators known as "boats" due to their shape. A pool of melted metal forms in the boat cavity and evaporates into a cloud above the source. Alternatively,the source material is placed in a crucible, which is radiatively heated by an electric filament, or the source material may be hung from the filament itself (filament evaporation). Evaporation is commonly used in microfabrication to deposit metal films. Common metals include carbon, gold, gold/palladium, and platinum.

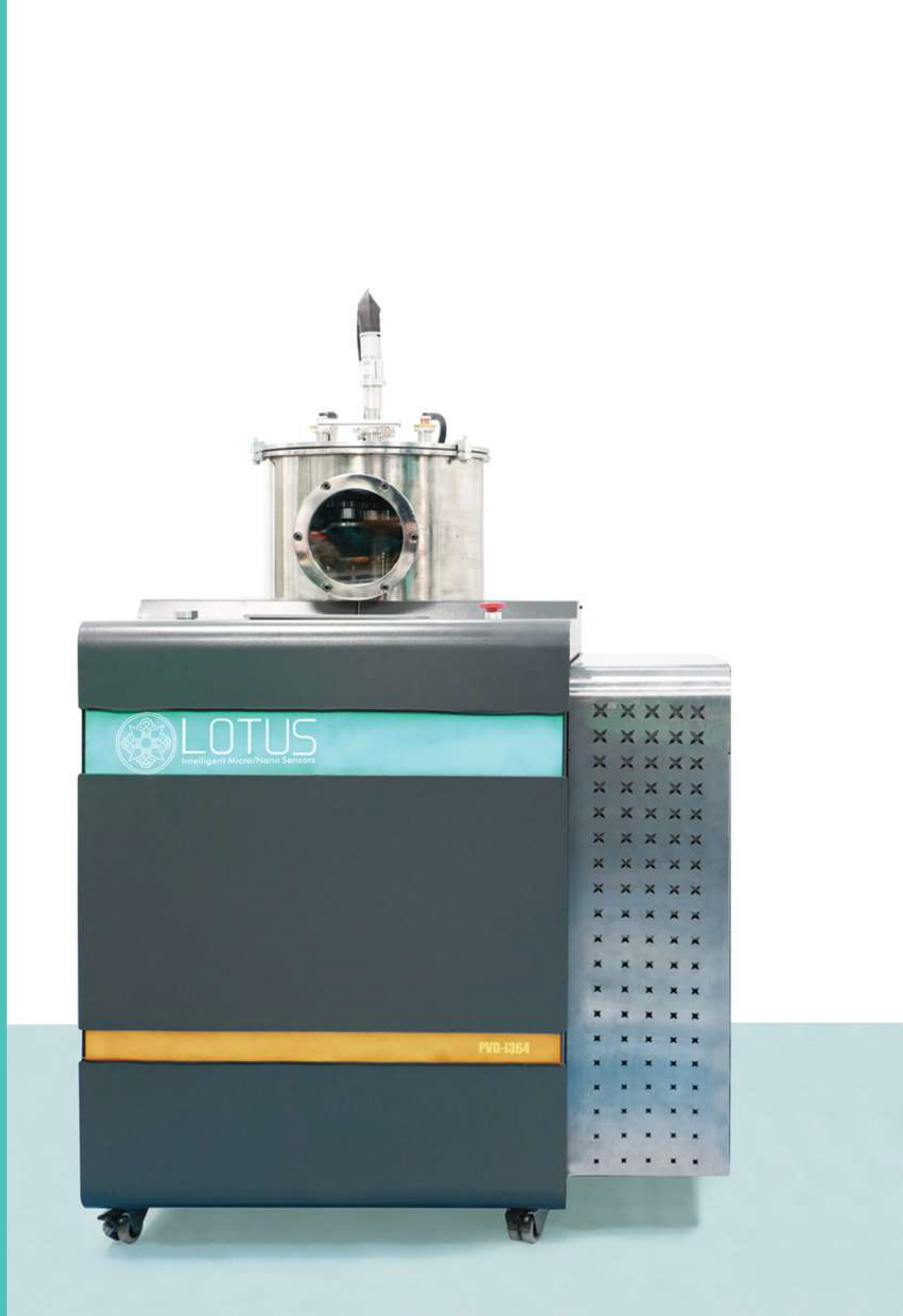


Thermal Evaporation System

Feature and benefit

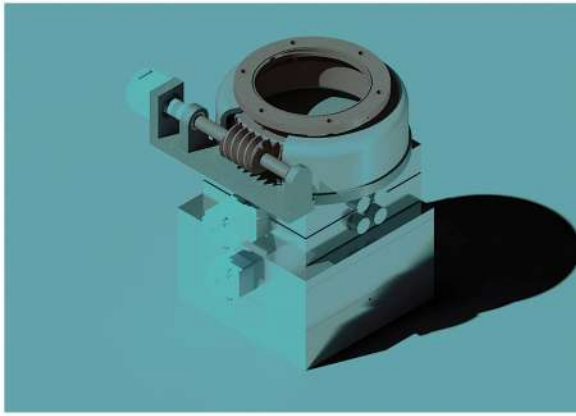
- Turbo molecular pump to provide fast and clean oil free high vacuum
- User friendly front panel color LCD based touch screen Siemens HMI control
- Siemens PLC based process automation with recipe
- Substrate heating facility up to 300°C
- Three different material can be deposited individually and at the same time
- Isothermal sample holder
- Full range pressure measurement
- Fully rotational stage design results in outstanding process control which guarantees superior uniformities and low operational costs.
- Recipe guarantee: offers starter recipes for every process utilizing its extensive library of process recipes with guaranteed process verification.
- High resolution film thickness monitor
- Maintenance friendly mechanical design.
- Shutter Assembly for All Sources

Technical data	
Wafer size	Up to 100mm
Wafer number	6
Evaporation material	Au, Cr, Ni, Ag, Al
Thermal source	3
Process temperature	Up to 300°C
Ultimate pressure	5 × 10-6
option	Graphite substrate heating system Wafer fully rotational stage


LOTUS
Intelligent Micro/Nano Sensors
PVD-1364

Mask Aligner

A mask aligner is an instrument enabling photolithography (also called optical lithography), which is a microfabrication process used to selectively remove parts of a thin film to create a pattern or a design onto a substrate. To generate this pattern, the substrate is first coated with a light-sensitive chemical (photoresist, or simply "resist"). (Coating of the substrate with a resist can be performed with the Spin Coater) The substrate is then introduced into the mask aligner and a mask with the desired pattern is placed above the substrate. A high intensity ultraviolet light is shined over the mask. The light only transmits through the openings in the pattern allowing to pattern corresponding areas of the photoresist layer of the substrate. Mask aligners are widely used to generate integrated electronic circuits, specialty photonics materials and microfluidic channels.



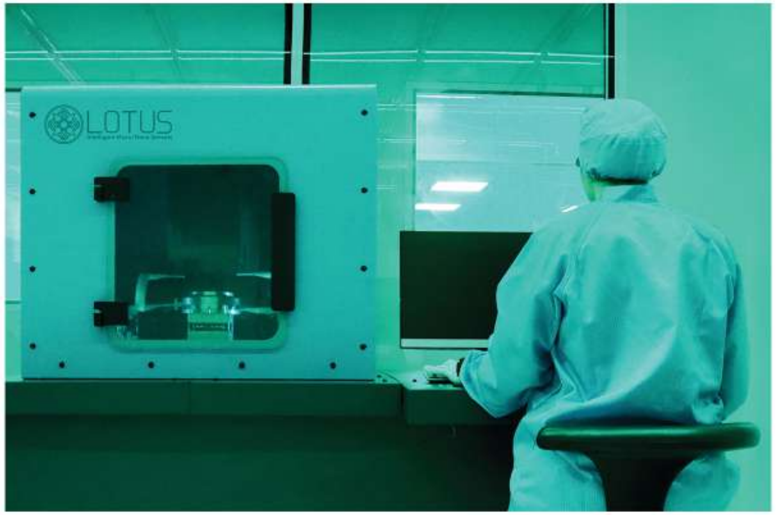
Mask Aligner

Feature and benefit

- Stand-alone, double sided, motorize alignment and tunable exposure system.
- Uses a photomask holder for glass and quartz
- Uses a substrate holder with stepper motors for X, Y, Z and Theta alignment
- Provides rapid and precise alignment of substrates with respect to photomasks
- Designed to accommodate wafers of 4" in diameter
- Uniformity: <+ 6%
- Exposure intensity peaks at 365nm
- Available with dual cameras
- Vacuum Chuck
- Precision Alignment Module
- Interchangeable Mask Holders and Substrate Chucks
- Accurate alignments to 1 micron
- Anti-vibration and passive benchtop isolation system

Technical data		
Substrate Stage	X, Y Travel Z Travel Each step Rotation	±30mm ±30mm 0.001 mm ±360°
Mask	Size	Up to 4" x 4"
Light source	Beam Size Lamp Max Power	Up to 5" square 250 Watt UV
Shutter Timer	Timer	0.1 to 999 sec. at 0.1 second increments
Dimensions	Height Width Depth	1500mm 1300mm 1300mm


LOTUS


LOTUS

What Is PVD Coating?

PVD stands for Physical Vapor Deposition. There are multiple kinds of PVD, each with their own advantages and disadvantages. PVD coating technologies are differentiated by how the coating is made, which can have a profound impact on the performance of the end product. Two coatings made from the same starting material, deposited on the same substrate, can have very different properties if the PVD process is different.

What is Cathodic Arc?

Cathodic arc is a type of physical vapor deposition that offers advantages in terms of coating adhesion, uniformity, utility on parts with 3- dimensional structure and scalability. Cathodic arc uses low voltage combined with high currents to create electrical arc discharges inside a vacuum chamber. Unlike sputtering which uses high voltages to force ionized, inert gas to ablate a target, the gas in cathodic arc serves primarily as a carrier for electricity.

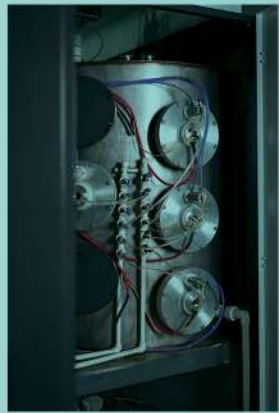
Those arcs result in local superheating of the cathode (made from the material to be deposited) resulting in simultaneous evaporation and ionization. It is this combination which provides cathodic arc with its unique advantages.

Coating options with cathodic Arc

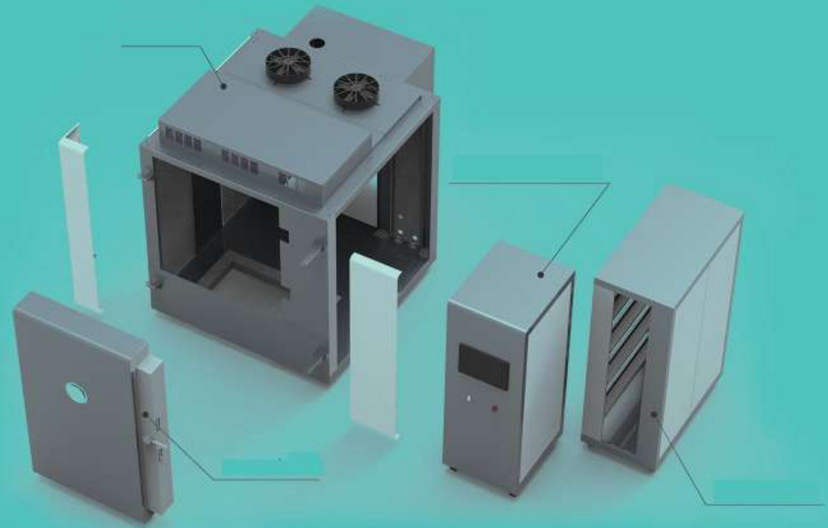
Cathodic arc is compatible with a wide variety of materials, allowing us to select exactly the right material for your application. Unlike other types of physical vapor deposition, cathodic arc does not suffer from selective elemental deposition. This means the cathode and the resulting coating have the same composition. This allows for the manufacturing of coatings made from desirable alloys. Cathodic arc can also be performed reactively, widening the range of available materials further. Coatings with excellent wear and lubrication properties can be manufactured by flowing reactive gasses such as oxygen, nitrogen or acetylene. This also provides control over color of the resulting coating.

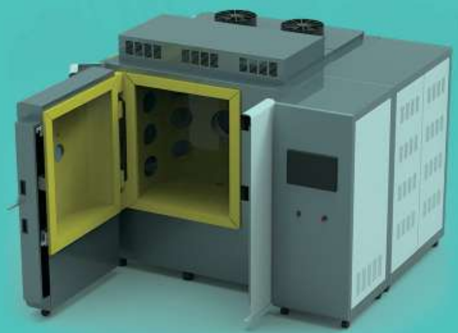
Arc PVD
Cathodic Arc Deposition

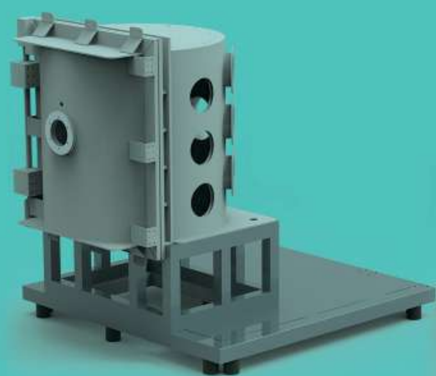
Arc PVD DS12

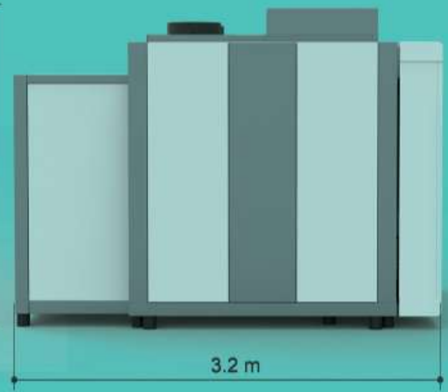


Industrial Design









Cathodic Arc PVD Coating

Cathodic Arc PVD Coating

AFM TIP

Atomic force microscope Tip(AFM Tip)

IMNS Silicon-AFM-Probes

IMNS Silicon-AFM-Probes provide the well-known features of the convenient AFM probes such as high application versatility and compatibility with most commercial AFMs with a small reproducible tip radius and a more well-defined tip shape. The typical tip radius of less than 10 nm and the minimized variation in tip shape provide more reproducible images and enhanced resolution.

General Info:

IMNS Silicon-AFM-probes are manufactured from highly doped, single crystal silicon without any intrinsic mechanical stress. Its low resistivity of 0.002-0.004 ohm/cm avoids electrostatic charging of the probe. The monolithic fabricated probes lead to an absolutely straight cantilever without any bending. Gold backside coating provides the high reflective chemistry stable layer that improves reflectivity 2.5 times in comparison with uncoated probes. The chemical inertness allows application in fluids or electrochemical cells. The tip is pointing into the <100> crystal direction.

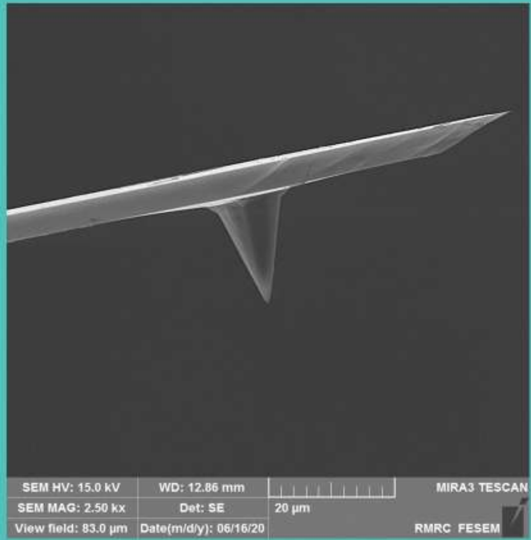
Tip Features

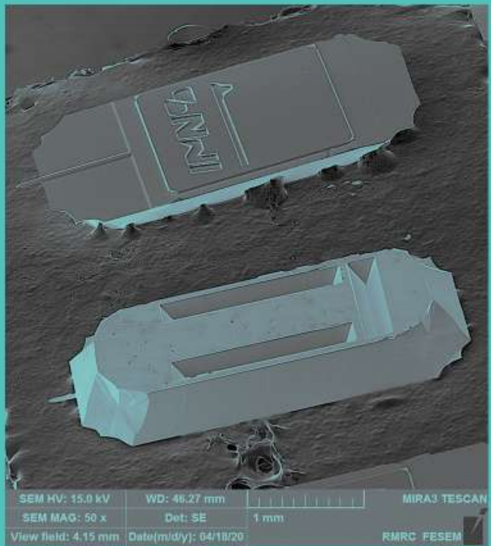
Total tip shape is tetrahedral
Tip radius is typically 5-10 nm
Tip height is 10 - 15 μm
Tip offset: 5 - 20 μm

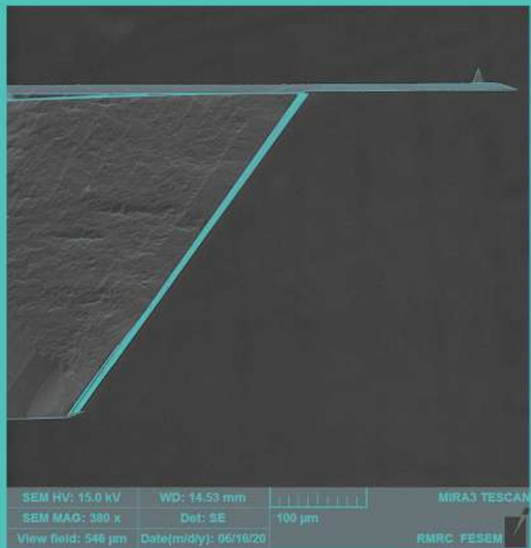
Cantilever Features

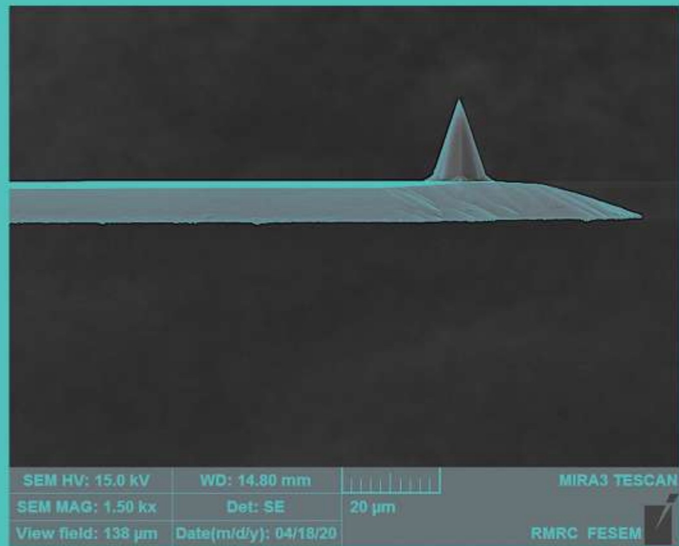
Backside width is given in probes Specification
Available for contact, non-contact, Semicontact mode.
Tip is set on the controlled distance 5-20 um from the free cantilever end.


SEM HV: 15.0 kV
WD: 15.03 mm
MIRA3 TESCAN
SEM MAG: 9.00 kx
Det: SE
5 µm
View field: 23.1 µm
Date(m/d/y): 04/18/20
RMRC FESEM

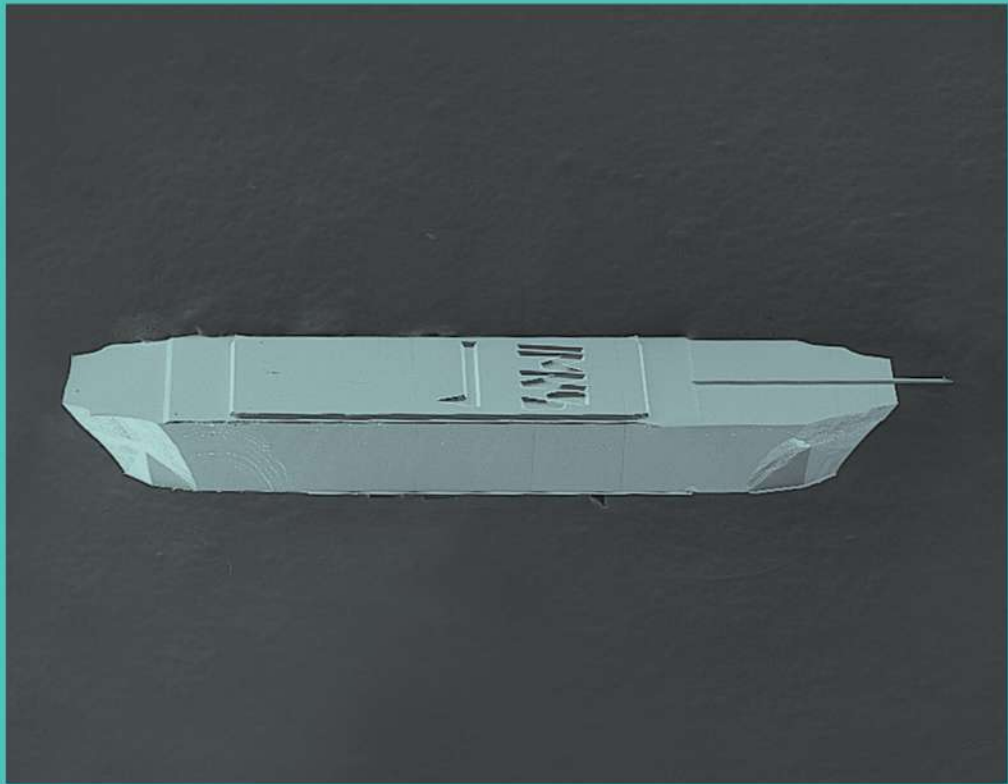

SEM HV: 15.0 kV
WD: 12.86 mm
MIRA3 TESCAN
SEM MAG: 2.50 kx
Det: SE
20 µm
View field: 83.0 µm
Date(m/d/y): 06/16/20
RMRC FESEM


SEM HV: 15.0 kV
WD: 46.27 mm
MIRA3 TESCAN
SEM MAG: 50 x
Det: SE
1 mm
View field: 4.15 mm
Date(m/d/y): 04/18/20
RMRC FESEM


SEM HV: 15.0 kV
WD: 14.53 mm
MIRA3 TESCAN
SEM MAG: 380 x
Det: SE
100 µm
View field: 546 µm
Date(m/d/y): 06/16/20
RMRC FESEM

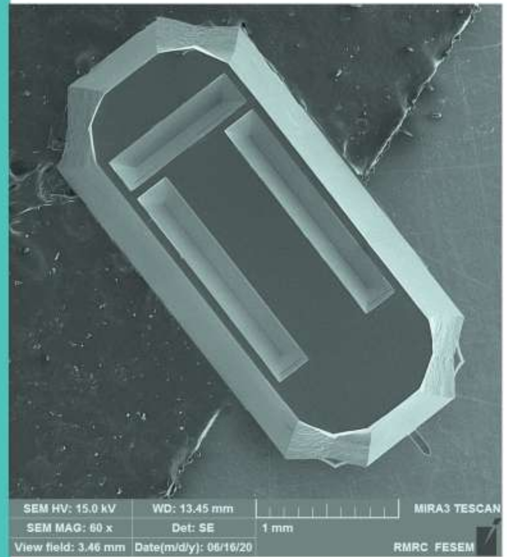

SEM HV: 15.0 kV
WD: 14.80 mm
MIRA3 TESCAN
SEM MAG: 1.50 kx
Det: SE
20 µm
View field: 138 µm
Date(m/d/y): 04/18/20
RMRC FESEM

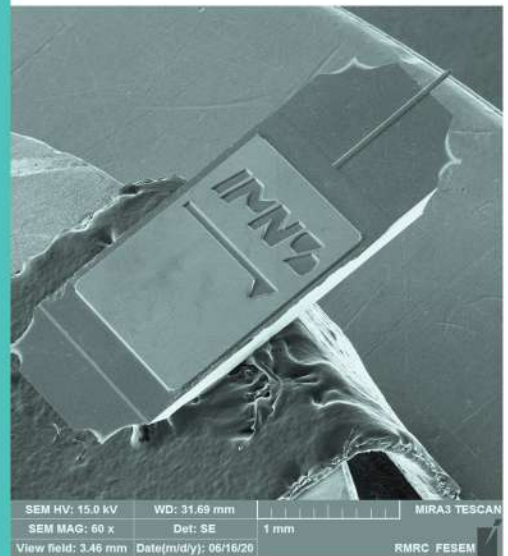
AFM Tip



Side view

Bottom view





Top view

Coatings

Au coating on detector side 70 nm thick layer of gold which enhances the reflectivity of the laser beam by a factor of about 2.5.
Au coating on both sides 70 nm thick layer of gold on both sides of the cantilever.
Magnetic coating for the visualization of magnetic domains selected Magnetic Probes with different hard and soft magnetic coatings are offered (refer to Magnetic probes).

Probes Series Name:

- Semicontact/noncontact probes (N series)
- Contact probes (C series)
- Electrical probes (E series)
- Magnetic probes (M series)

N 01 / Au

N-Non-Contact and Semicontact
C-Contact

Probe Series

Reflective Coating

Probes series name

Series	Mode	Key Features	Applications	Tip & Coating Options
C Series	Contact Mode	Short, stiff cantilevers; high force sensitivity	Hard surfaces, topography, mechanical properties	Silicon tip, optional backside coating
N Series	Semi-contact/ Non-contact	Longer, softer cantilevers; operated at resonance	Soft materials, polymers, biology, high-res imaging	Silicon tip, optional backside coating
E Series	Electrical Modes	Conductive coating; low-noise response	Current mapping, surface potential, conductivity	Silicon tip with Au conductive coating
M Series	Magnetic (MFM)	Magnetic coating; magnetically sensitive	Magnetic domains, data storage, nanomagnetics	Silicon tip with magnetic coating

Substrate Specification	
Material	Single Crystal Silicon
Chip Size	Chip Size 3.4×1.6×0.3 mm
Reflective Side	Cr/Au
Tip Coating	-

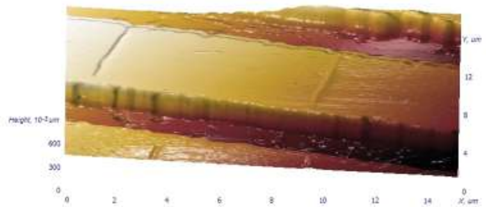
Semicontact/NonContact Probes N Series

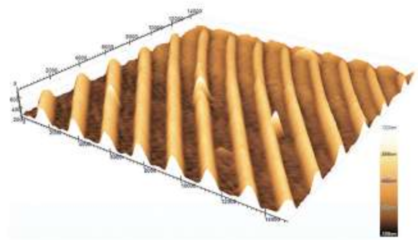
Cantilever Specification							
Series	Cantilever length±10μm	Cantilever width±5μm	Cantilever thickness ±1μm	Resonance frequency (kHz)			Force Constant(N/m)
				min	typical	max	typical
01	225	45	3.5	60	100	190	7
10	225	45	7	120	200	320	57
30	125	45	3.5	220	300	430	42

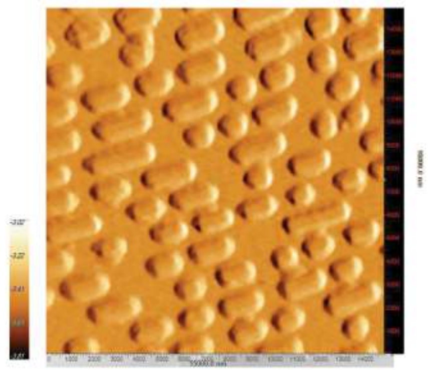
Contact Probes C Series

Cantilever Specification							
Series	Cantilever length±10μm	Cantilever width±5μm	Cantilever thickness ±1μm	Resonance frequency (kHz)			Force Constant(N/m)
				min	typical	max	typical
01	225	45	2	35	55	75	1.2
10	450	45	3.5	17	24	45	0.8
20	450	45	2	8	14	35	0.15

Scanning Result







Cantilever Specification							
Series	Cantilever length±10μm	Cantilever width±5μm	Cantilever thickness ±1μm	Resonance frequency (kHz)			Force Constant(N/m)
				min	typical	max	typical
01	225	45	3.5	60	100	190	7
10	225	45	7	120	200	320	57
30	125	45	3.5	220	300	430	42

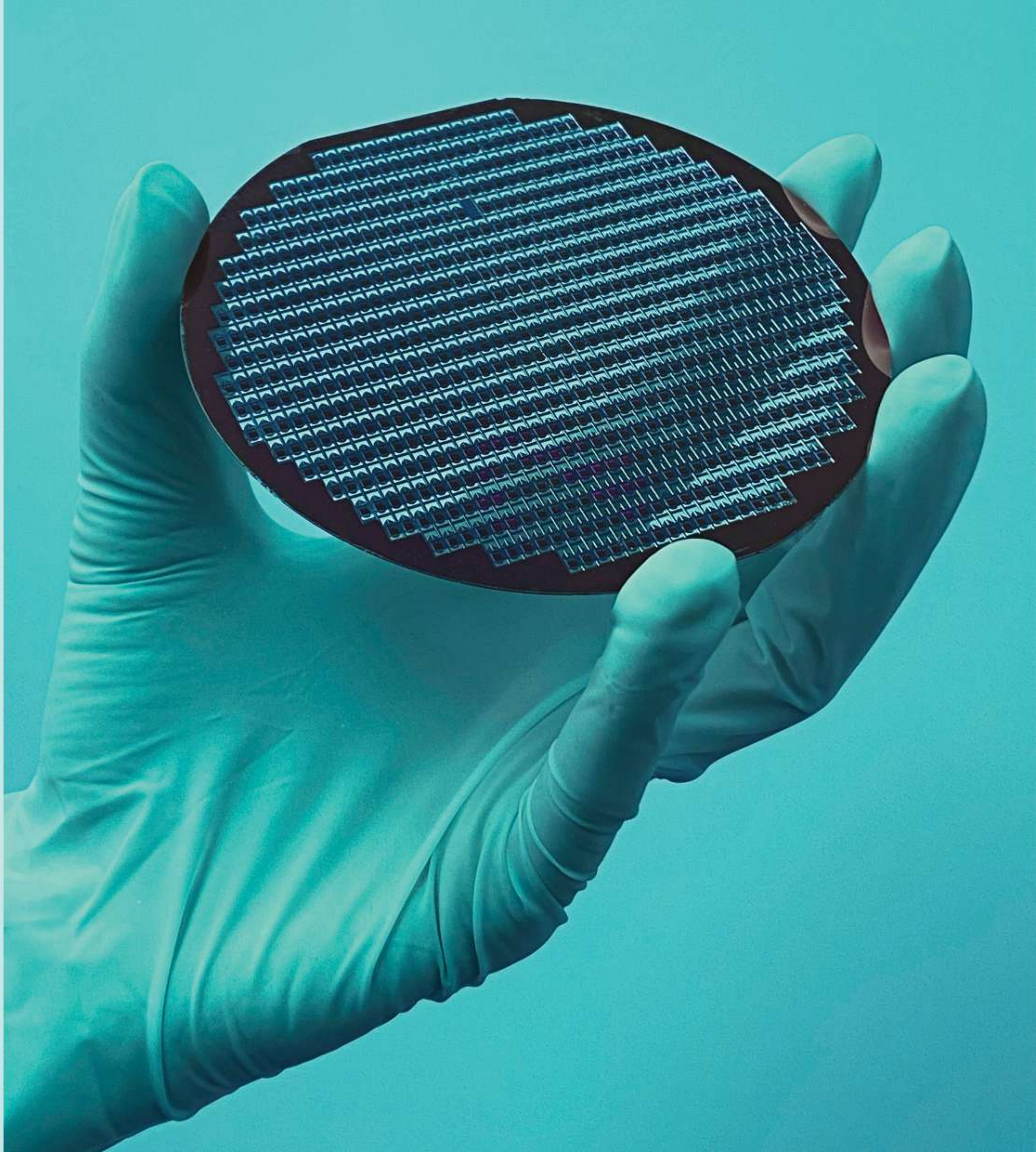
Electrical Probes E Series

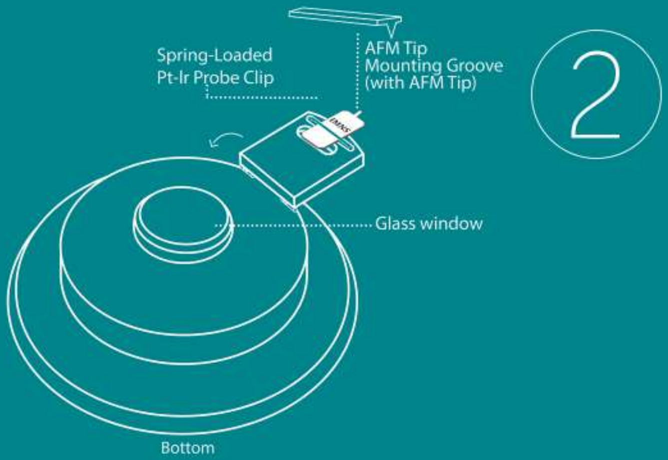
Substrate Specification	
Material	Single Crystal Silicon
Chip Size	Chip Size 3.4×1.6×0.3 mm
Reflective Side	Cr/Au
Tip Coating	Cr/Au

Magnetic Probes M Series

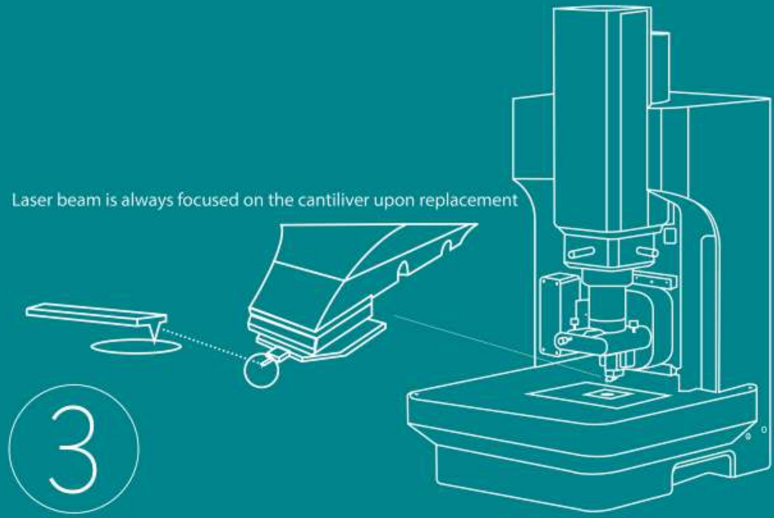
Substrate Specification	
Material	Single Crystal Silicon
Chip Size	Chip Size 3.4×1.6×0.3 mm
Reflective Side	Cr/Au
Tip Coating	Co or Ni/Cr

4 - inch
AFM tip
wafer

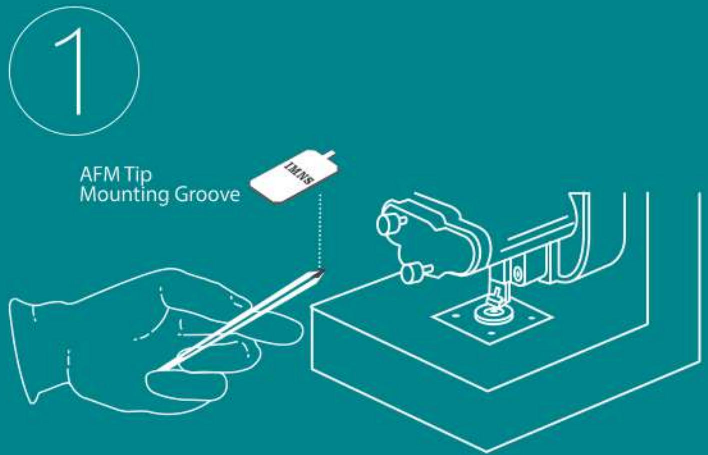




2
Spring-Loaded
Pt-Ir Probe Clip
AFM Tip
Mounting Groove
(with AFM Tip)
Glass window
Bottom



Laser beam is always focused on the cantiliver upon replacement
3



1
AFM Tip
Mounting Groove

4

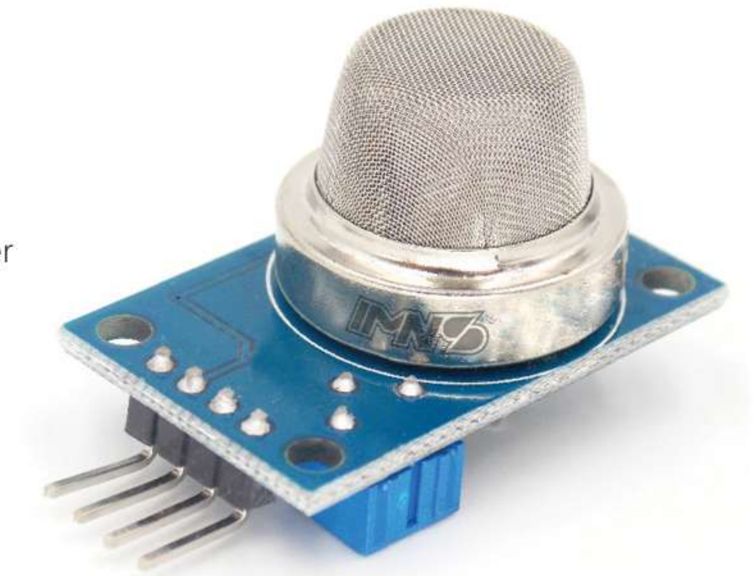
50pieces AFM tip package

Atomic force microscopy (AFM) or scanning force microscopy (SFM) is a very-high-resolution type of scanning probe microscopy (SPM), with demonstrated resolution on the orderof fractions of a nanometer, more than 1000 times better than the optical diffraction limit.
AFM was developed to overcome a basic draw back with STM – it can only image conducting or semiconducting surfaces.
The AFM has the advantage of imaging almost any type of surface, including polymers, ceramics, composites, glass, and biological samples.

Thermal conductivity detector (TCD)

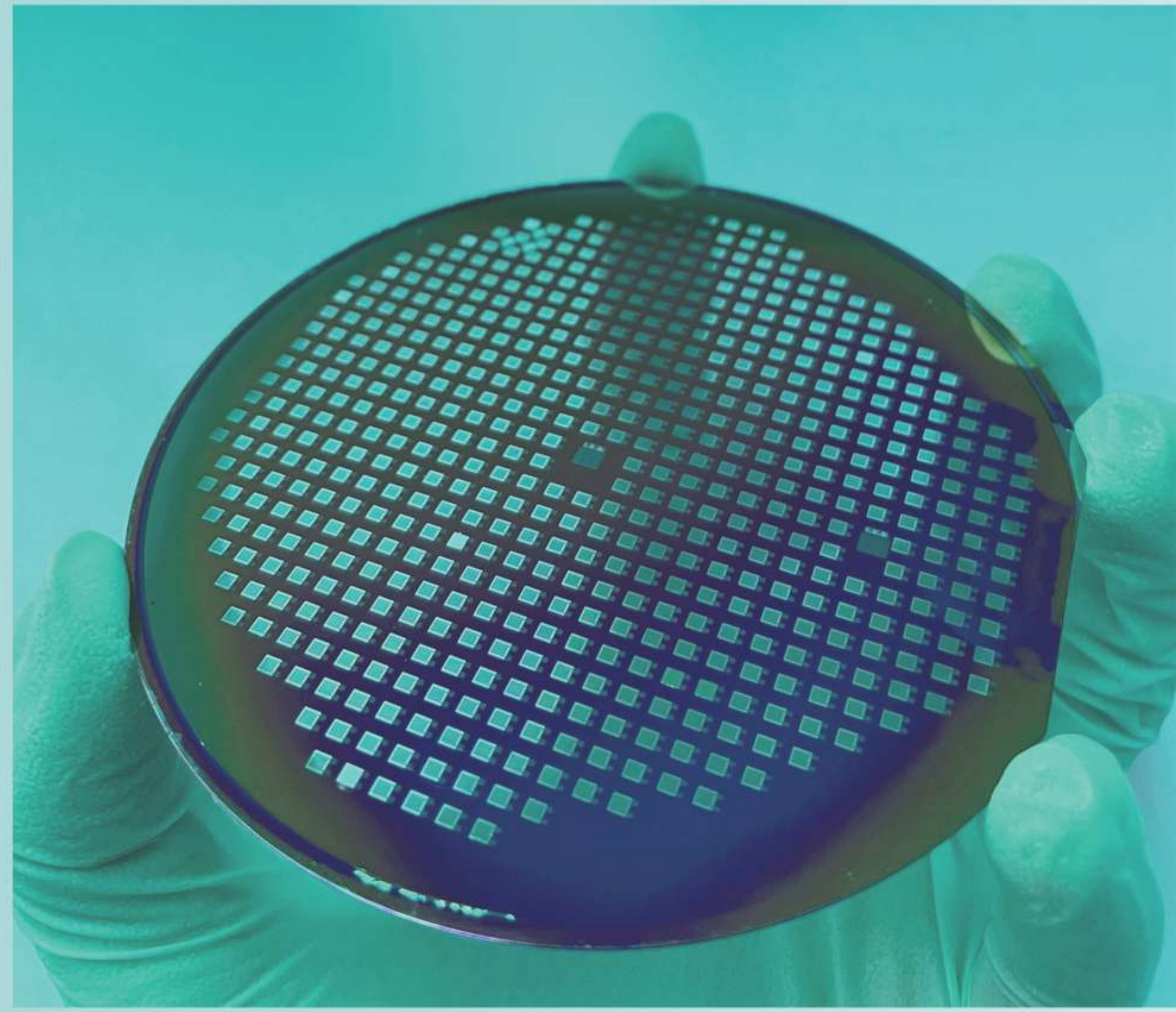
In recent years, gas sensors are increasingly used in the growing markets of systems for gas analysis in the automotive industry and for medical and environmental monitoring. Gas detection based on thermal conductivity is widely used in process control and in gas chromatography.

Thermal conductivity detectors (TCD's) are particularly suitable for detecting hydrogen, since the thermal conductivity of hydrogen is about 7 times higher than air. Thermal conductivity gas sensors are especially suitable in safety applications for fuel cells. In such systems, leakage of hydrogen needs to be detected before hydrogen concentrations reach the lower explosive limit (LEL) of 4% in air. The most common TCD technique is made using silicon technology, which is based on a thin metal wire, usually made of platinum. The wire simultaneously operates as both the heater and sensing element. The wire and the surrounding medium under investigation are heated by applying a constant electrical current.



TCD

Thermal conductivity detector



Application

■ Replace traditional TCD in gas chromatography (GC)

■ Leak detection for Natural Gas (CH4), Hydrogen (H2), and refrigerant gases

■ Natural gas quality control

■ Natural gas engine combustion control

■ Fuel cell applications

■Carbon Dioxide (CO2) monitoring for Indoor Air Quality (IAQ)

■ Methane (CH4) detection for mining safety

■ Pirani vacuum gauge

■ Measurement of concentration of Helium, Hydrogen, etc. in air and other gases

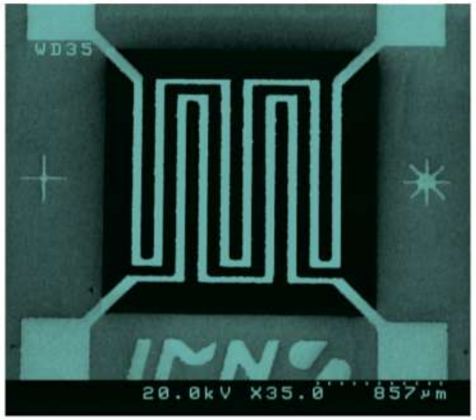
■ Measurement of thermal conductivity and gas type

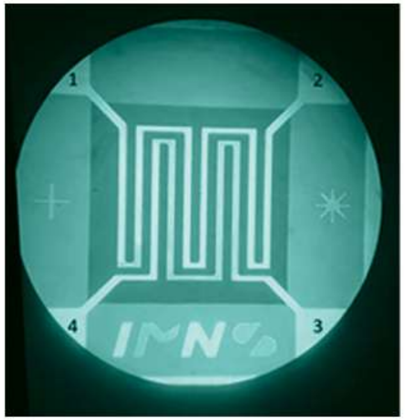
■ Measurement of binary gas-mixture composition

Features

- Extremely low power consumption
- Operate in high temperature environment
- Very stable long-term operation
- Minimal field maintenance required

TCD



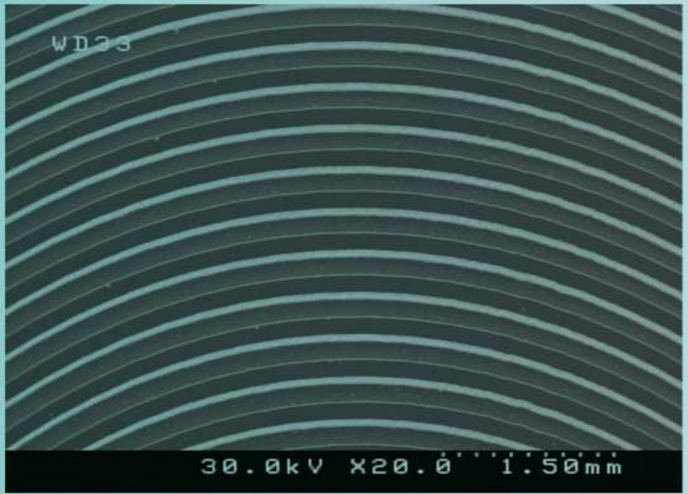


Micro GC SYSTEM
(MEMS Gas Chromatography System)

A gas chromatograph is a chemical analysis instrument for separating chemicals in a complex sample. A gas chromatograph uses a flow-through narrow tube known as the column, through which different chemical constituents of a sample pass in a gas stream (carrier gas, mobile phase) at different rates depending on their various chemical and physical properties and their interaction with a specific column filling, called the stationary phase. As the chemicals exit the end of the column, they are detected and identified electronically.
The function of the stationary phase in the column is to separate different components, causing each one to exit the column at a different time (retention time).

The most commonly used detectors are the flame ionization detector (FID) and the thermal conductivity detector (TCD).While TCDs are essentially universal and can be used to detect any component other than the carrier gas.

Commercially available GC analyzers use conventionally manufactured components (~30 kg) and need power and gas sources that often limit their portability and suitability of "outside-laboratory" use. Miniaturization of GC is based on theoretical and practical considerations. A microfabricated GC system requires a number of components to function properly: preconcentrator, micro-valves for injecting the sample into the carrier gas, microfabricated columns well-functionalized for the specific use, heaters and temperature sensors for controlling column temperature, and detector(s) for detecting the arrival of different types of molecules.



Micro GC

Application

Natural gas and extended natural gas analysis
H2S and odorant in natural gas
SO2 and H2S gas monitoring
Permanent gases and olefins in refinery gas
Syngas, fuel cell, landfill gas and biogas
Impurities in petrochemical products and specialty gases
Solvent/VOC gas monitoring
Catalyst research for alternative energy
Mud logging in oil and gas exploration
Mine gas

SENSE YOUR IDEAS