

## Gas Chromatograph (GC)

Gas chromatograph (GC) is an analytical instrument for measuring the content of volatile/non-volatile components of a sample. GC analyzing procedure starts with sample injection which is then carried to the column using a stream of an inert gas (usually Helium or Nitrogen). Various components of the sample are separated in a column based on their interactions with the stationary non-volatile phase. In other words, the component with greater interaction would be separated from those with smaller interaction. The quantity of these components is measured by detectors. GC offered by adeeco is equipped with two conventional types of detectors: FID (Flame Ionization Detector) and TCD (Thermal Conductivity Detector). However, the other types of detectors could be installed, too. Another interesting feature of this device is its capability to be coupled with a two-dimensional GC module (GC×GC) which lets you identify the most complex mixtures.



### Application

#### Pharmaceutical Industry

- Pharmaceutical quantitative analysis, Organic Volatile impurities (residual solvents),

#### Environmental Analysis

- Analysis of Aromatic Pollutant, Volatile Organic Compound, Pesticides.

#### Petrochemistry

- Controlling the production process of saturated hydrocarbons, olefins and light diolefins

#### Food industry

- Analysis of Essence, colorant, flavors and trace elements in Food

#### Forensic Science

- Forensic Pathology, Crime Scene Testing, Arson Investigation

## Features

- High resolution
- Reproducibility
- accurate and High speed
- Low dead volume inlet
- Accurate and high performance oven with various step temperature programming
- EPC high resolution gas control for all inlets and detectors
- User friendly software with Online help in all languages

SPECIFICATION		
Oven Temperature Range	Room Temperature to 350°C	PID Control
Injector-Detector Temperature	Room Temperature to 400 °C	PID Control
Max Program Steps	5 Steps	
Acceleration Rate of Oven Temperature	1- 50°C/min	
FID Detector	High Speed	Up to 300 Hz
FID Dynamic Limit	10 e7	Nitrogen
FID Limit of Detection	10 e -12 g/s	Dodecane
TCD Limit of Detection	10 e -9 g/ml	Dodecane
TCD Dynamic Limit	10 e5	
Power	2.5 KW- 220 VAC	50-60 Hz
Dimension	50×45×49	Length×Height×Width (cm)
Oven Dimension	28×29×28	Length×Height×Width (cm)
Weight	40	Kg

# Magnetron Sputter coater

Adeeco offers several models of sputter coaters which are well designed with standard features, to meet the academic and research requirements. These models are ideal for the users who demand for high quality thin film deposition, especially conductive coatings, using a user friendly equipment. Magnetron sputtering is a plasma coating process whereby sputtering material is physically removed by bombardment of ions of an inert gas (normally Argon) to the surface of target material. In other words, by applying a high voltage, glow discharge is created, resulting in acceleration of ions. When the argon-ions collide with the target, sputtering materials will be ejected from the target surface, leading to the formation of a coating layer on the products.

## Features

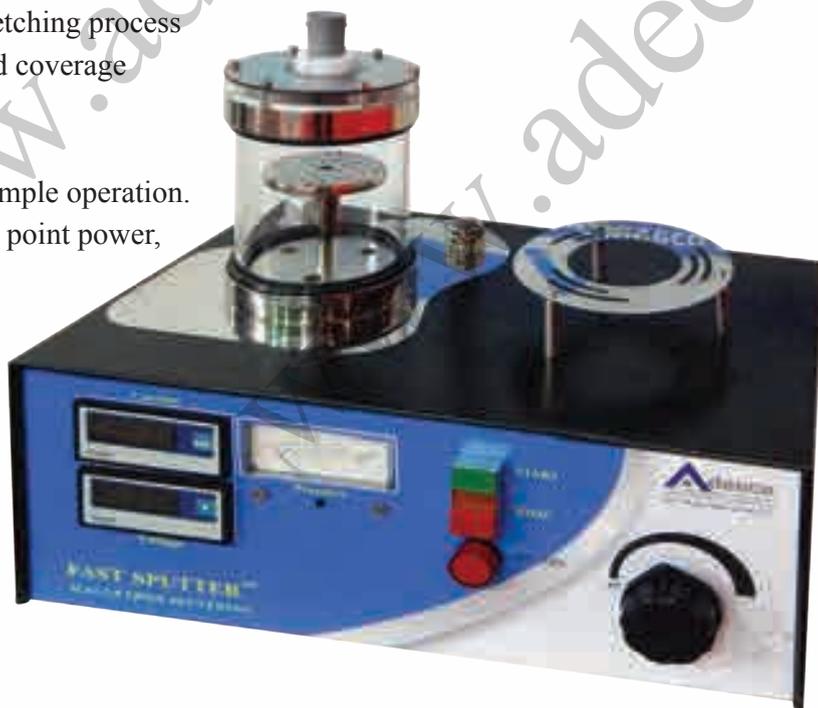
- Simple operation
- Compact design
- Glow discharge capability
- DC power supply with a maximum output of 200 mA.
- Pre clean samples before deposition with etching process
- 2 inch sample for excellent conformity and coverage
- 200 V bias voltage
- Adjustable Stage height
- Full color touch screen control provides simple operation.
- Control timed sputter and Etch process set point power, duration and thickness.
- A crystal monitor for online thickness measurement.

## Advantages

- High deposition rate
- Ease of sputtering any metal, alloy or compound
- High-purity films deposition
- Extremely high adhesion of films
- Ability to coat heat-sensitive substrates
- Ease of automation
- Excellent uniformity on large-area substrates

## Application

- Microelectronic circuits and chip carriers
- Electrical resistance films, e.g. Ni-Cr for strain gauges
- Magnetic films for general magnetic storage devices, floppy discs, tapes and thin-film magnetic heads.
- Opto-storage devices. e.g. compact discs and video discs.
- Corrosion-resistant films (Cr-Ni)
- Bonding layers
- Coating of noble metals including Gold, Silver and etc.
- Preparation of TEM, SEM samples



### SPECIFICATION

Models	Parameters	SUPER SPUTTER COATER	LAB SPUTTER COATER	FAST SPUTTER COATER
Glass Jar Chamber		200×306 cm	200×215 cm	150×120 cm
Turbo Molecular Pump		80 L/s	80 L/s	
Two-Stage Rotary Pump		160 L/m	160 L/m	160 L/m
Rotating Stage		Optional	Optional	
Sputter Gun Position		Bottom	Bottom/Upper	Upper
Thickness Measuring Crystal		✓	✓	
DC Power Supply		200 mA		
RF Power Supply		Optional	Optional	
Co-Sputtering Processes		✓		
2-Inch Diameter Cathode		3	1	1
Mass Flow Control		✓	Optional	
PLC Full-Color Touch Screen		✓	✓	

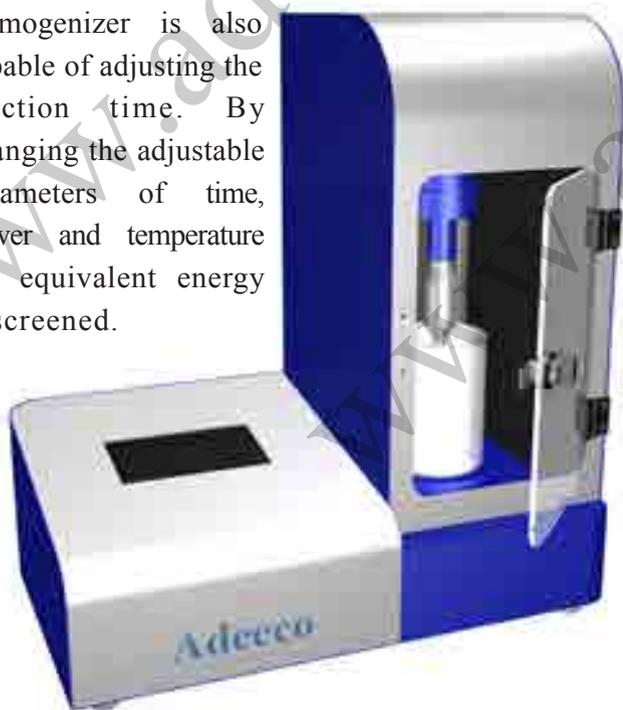


# Ultrasonic Homogenizer

Ultrasonic Homogenizer provided by Adeeco Company is fabricated according to international standards, the unique facilities of which meet all of the research and industry requirements.

We offer one of the most comprehensive ultrasonic processors for dispersing Nano-particles in fluids. Ultrasonic Homogenizer is a programmable laboratory-scale equipment which can be utilized in projects and also in making innovative research idea work. This device is set on 20 kHz working frequency and is capable of applying different output powers with different intensities.

Other feature of APU500-015 is the automatic frequency setting in range of 1 kHz. Adeeco Ultrasonic Homogenizer is also capable of adjusting the reaction time. By changing the adjustable parameters of time, power and temperature the equivalent energy is screened.



## Features:

- Precise control of applied parameters
- Reproducible results
- Flexible settings
- Economic
- High efficiency

## Application

### Nanomaterials

- Dispersing and size reduction
- Improving the accuracy of particle size/ morphology measurement.

### Biotechnology

- Extraction of intracellular materials
- Ultrasonic lysis: cell disintegration and extraction

### Food and Beverage

- Disintegration of cells
- Extracting intracellular components or obtain cell-free bacterial enzyme
- Acceleration of an enzyme reaction in liquid foods
- Acceleration of fermentation
- Mixing, homogenizing, dispersion of a dry powder in a liquid
- Emulsifying of oil/fat in a liquid stream

### Cosmetics

- Produce fine-size emulsions
- Dispersion and distribution of the powder, pigment or mineral particles

### Ink and inkjet

- Size Reduction/distribution of ink pigments

### Paint and Coating

- Dispersion, emulsifying and deagglomeration of pigments, fillers, chemical additives, crosslinkers and rheology modifiers in coating.

### Chemistry

- Sonochemical Reaction and Synthesis

### Oil and Gas

- Processes in the production of fuels: mixing, dispersing, homogenizing and dissolving

### Cement and Concrete

- Mixing of Cement Paste For Concrete

### Wire and Cable

- Cleaning: removing lubrication residues like oil or grease, soaps, stearates or dust before processing likes cladding, extrusion and etc.



Specification						
Models	APU100	APU200	APU500a	APU500b	APU500c	APU1500
Power source	220V-50-60 Hz	220V-50-60 Hz	220V-50-60 Hz	220V-50-60 Hz	220V-50-60 Hz	220V-50-60 Hz
Max output power	100 W	200 W	500 W	500 W	500 W	1500 W
Power range	0-100W	0-200W	0-500 W	0-500W	0-500W	0-1500W
Probe	Titan-3,6, 12 mm	Titan-3,6, 12 mm	Titan-3,6, 12 mm	Titan-3,6, 12 mm	Titan-3,6, 12 mm	Titan-3,6, 12 mm
Working Frequency	20 kHz	20 kHz	20 kHz	20 kHz	20 kHz	20 kHz
Temperature Control	-	-	0-100°C	-	-	-
Temperature Control system			Cooling and Heating Thermoceramic			
Sound box	-	-	✓	✓	-	-
Weight	15 kg	15 kg	22 kg	15 kg	15 kg	22 kg
Probe Holder	✓	✓	✓	✓	✓	✓

**Competitive features** of this device in compare to other devices in internal and external market are a cooling and heating system and IR non-contact temperature sensor. The most important advantage of this device is the feedback circuit , by which the frequency is automatically adjusted with environmental changes.



# PlasmaTex

## Atmospheric Plasma Machine for Surface Treatment

Duo to its energetic species and low temperature nature of plasma, PlasmaTex machine, provided by Adeeco, is suitable for processing of heat sensitive surfaces, especially textiles. During surface processing, high level of surface activation is gained by formation of functionalized group on surface and roughness adjustment. The roll to roll equipment would enhance the surface energy of any texture material in order to eliminate water, paint and other chemical substance consumption.

### Application

- Sterilization
- Hydrophilicity Improvement
- Adhesion improvement
- Dyeability enhancement
- Anti-shrinkage finishing
- Desizing
- Improvement of fabric handle



### Features

- Processing of various surfaces including textiles, polymers, and metal thin films. up to 3 mm.
- Capable of both side processing
- Adjustable working width (up to 2.2 m) depend on application.
- Adjustable processing rate for:
  - Textiles: Up to 30 m/min
  - Polymers: Up to 100 m/min

### Advantages

- Enhancement of surface energy and hydrophilic property
- No need of expert operator or special tool
- Easy cleaning of equipment
- Ability of applying different electrodes in system.
- Sharp decline in energy and water consumption (up to 80%)
- Little wastewater formation
- Environmentally friendly Technology.



SPECIFICATION						
Models	PlasmaTex 1080	PlasmaTex 2080	PlasmaTex 20160	PlasmaTex 40160	PlasmaTex 30220	PlasmaTex 60220
Material	Woven, Knitting and Non-Woven fabrics					
Material thickness	2 mm					
Operating Voltage	30 kV					
Frequency	25 kHz					
Amperage	70-75 A					
Power (kW)	10	20	20	40	30	60
Electrode Diameter	6 mm					
Maximum inter-electrode gap	3 mm					
Roller Width (mm)	800	800	1600	1600	2200	2200
Production rate	5-60 m/min					

# Pulsed Laser Deposition (PLD)

Pulsed-laser deposition (PLD) is one of the versatile methods of depositing a thin film of a wide range of materials including metals, carbon, and numerous complex systems including complex-oxide heterostructures, superlattices, and well-controlled interfaces.

pulsed laser deposition steps consists of a rapid removal of material from a solid target and formation of an energetic plasma plume, which then condenses onto a substrate. Despite the simplicity of the technique, the Processes of PLD – including ablation, plasma formation, plume propagation, as well as nucleation and growth – are rather complex.

## TEA-CO<sub>2</sub> pulsed laser

Carbon dioxide excitation of transverse electric laser (TE CO<sub>2</sub>) is a pulsed laser capable of increasing the repetition frequency up to 100 Hz. Each Pulsed laser has Energy of 0.1, 2, 30 joules. The length of the beam pulse is 100-200 ns. The maximum power-defined by pulsed energy divided by pulse's length- is around 1-100 MW.

## Application

### Electronics

- Transistors and diode fabrication
- MEMS

### Batteries

- Buffer layers

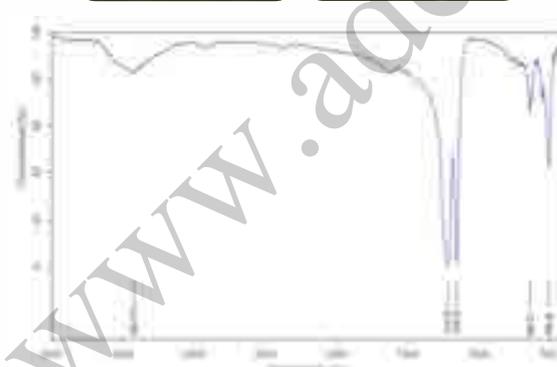
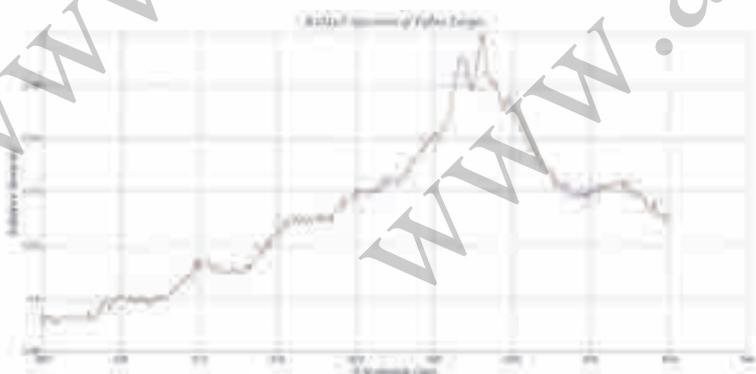
### Tribological applications

- wear parts (cutting tools, machine parts, drills, etc.)

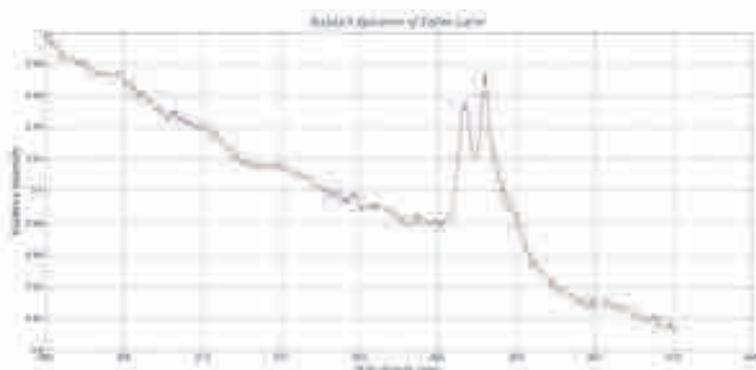
### Sensors

- Chemical sensors fabrication

## The layer deposited by pulsed laser deposition system



FTIR spectrum of normalized PTFE layer



SEM image of PTFE layer

**Features:**

- Deposition of all kinds of polymer material
- No need of low vacuum
- High safety
- Capable of beam's control (optional)
- Ability of using Nd:YAG laser for metal deposition (optional)
- Automatic rotation of target for sequential deposition
- The ability of heating the substrate to 100°C
- Adjustment of pressure from  $2 \times 10^{-2}$  mbar to  $10^{-5}$  mbar (optional)
- Ability of purging gas (optional)
- Ability of laser heating (Optional)

**SPECIFICATION**

Laser Power	1 joule per pulse
Pulse Width	100 ns
Power	10 MW per pulse

**Advantages:**

- Deposition under low vacuum
- High rate of deposition
- Very dense layers formation

**SPECIFICATION**

Energy	100 mJ	2 J	30 J
Max Power	1 MW	20 MW	100 MW
Max Repetition Rate	100 Hz	10 Hz	1 Hz
Wave Length	9-11 $\mu$ m		
Profile Size (mm)	10x10	15x15	50x50
Voltage- Current	Single phase 220 V – 10 A		



# Thermo-Chemical Vapor Deposition (TCVD)

Nowadays, Chemical Vapor Deposition, CVD, is considered as one of the fundamental method of manufacturing in various industries especially electronics. In a typical form of CVD process, the coating material is vaporized by heating, then it is introduced into a vacuum chamber containing the sample to be coated. Finally, the gaseous reactants is deposited on the substrate via condensation, forming a uniform coating. Frequently, volatile by-products are also produced, which are removed by gas flow through the reaction chamber.

Microfabrication processes widely use TCVD to deposit materials in various forms, including: monocrystalline, polycrystalline, amorphous, and epitaxial.

TCVD system is a cost efficient and high performance chemical vapor deposition system. It consists of a precision bench-top furnace using high-quality heating elements.



### Advantages:

- Versatility- Any kinds of elements and compounds can be deposited on the substrate
- High Purity – typically 99.99-99.999%
- High Density – nearly 100% of theoretical one
- Material Formation well below the melting point
- Coatings Deposited by CVD are conformal and near net shape
- Economical production, since many parts can be coated simultaneously

### Application

#### Material Science

- Polymerization
- Carbon nanotubes
- Ceramic
- Supper thin coating

#### Electronics/photronics

- Integrated Circuits (IC)
- Optoelectronic devices
- Fiber optics and DWDM components
- Semiconductor devices

#### Biotechnology

### General Specification

Temperature control	PID with 10 thermal program
Pressure control	Digital /Pirani /Penning gauge
Control of gases	Mass flow controller
Reactor	Quartz
Structure	1 mm thickness metallic sheet
Insulation	Alumina insulated material
Vacuum	Rotary pump with $10^{-2}$ mbar pressure
Voltage	220 V

TCVD system has three models including single zone, double zone and triple zone, each of which has two types of heating source: element and lamps. The specification of each model is given in following tables:

Models	Single zone (ATCVD-1Z)		Double zone (ATCVD-2Z)		Triple zone (ATCVD-3Z)
	Element type	Lumpy	Element type	Lumpy	Element type
Characteristics	1 zone program control: One deposition zone-Powder and sample at the same temperature		2 zone program control: Two deposition zones-Able to set the Powder and sample temperature at different levels		3 zone program control: Two deposition zones-Able to set the Powder and sample temperature at different levels
					5 channel reader-Able to read the temperature online
Power (kW)	2.5		3		3.5
Dimension (HxLxW)	85x50x60 cm		85x60x60 cm		85x70x60 cm

#### Specification of Element type series

Heating system	Elements made of Fe-Cr-Al alloy doped by Mo
Temperature	Up to 1100°C
Heating rate	Up to 25°C/min

#### Specification of Lumpy series

Heating system	4500 Watt thermal lamp
Temperature	Up to 750°C
Heating rate	Up to 200°C/min

## Particle Size Analyzer-DLS

Dynamic light scattering method is commonly used for determination of Particle size by measuring the intensity alteration of scattered light signal from a suspension or solution. Using these intensity fluctuations, one can measure the velocity of Brownian motion and hence the size of particles dissolved or dispersed in the solutions.

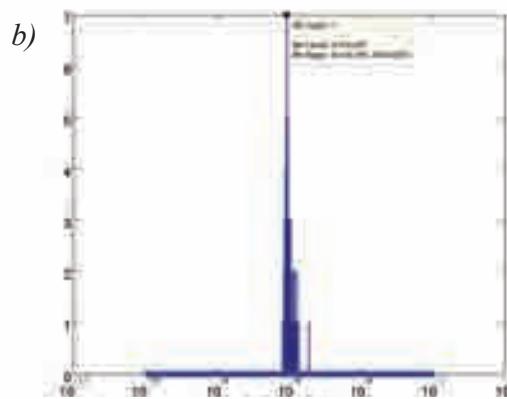
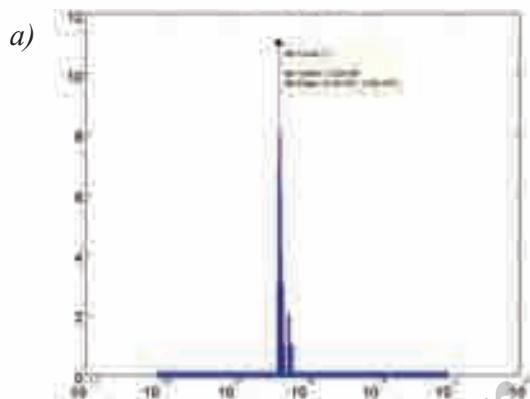
In dynamic light scattering compared to static light scattering, not the angle dependent, but the timely variation of the scattering intensity is utilized for the particle size determination. DLS can be performed on a time scale measured in minutes rather than hours. The importance of the technique lies in its non-invasive character.

The intensity fluctuations are a consequence of particle motion, and the measured property in the correlation analysis is the distribution of diffusion coefficients.



### Application

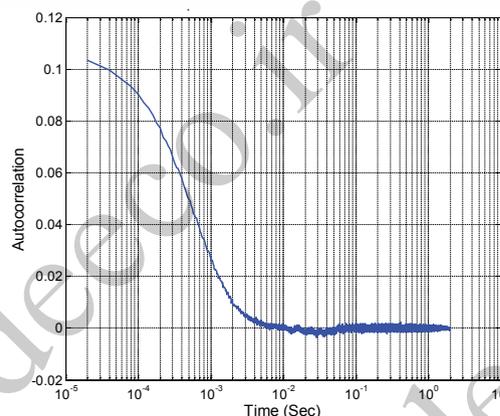
- Nanotechnology
- Biotechnology
- Ceramics
- Food
- Medicine / pharmaceuticals
- Paint and pigment
- Semi-conductor (CMP), ...



Particle size distribution histogram for samples with the size of (a)  $294 \pm 50$  nm, (b)  $847 \pm 70$  nm.

**Features:**

- Extremely wide measurement range from 30 nm - 10  $\mu$ m
- Easy operation, no cleaning or maintenance required
- Rapid analysis
- Simple, user friendly and intuitive software
- High resolution and precision
- Compact design allows for installation in any laboratory environment
- Ergonomic design for easy operation



Correlation function obtained by DLS for particles with the average size of  $294 \pm 50$  nm.

SPECIFICATION	
Particle Size Measurement Range	1 nm – 10 $\mu$ m
Molecular Weight Measurement	✓
Zeta Potential Measurement	Capable of upgrading
Laser Power	50 mW
Laser Type	NdYAG
Laser Wave Length	532 nm
Detector	PMT
Detector Number	1
Specimen Holder	1
Touch Display	✓
Internal PC	✓
PC Connection	✓
Accessories	✓

## Dip Coater

Dip coating process is considered as one of the oldest commercially deposition methods consisting of following steps. It starts with immersing the substrate into the tank containing precursor solution at a constant speed followed by leaving it motionless for a certain dwell time to ensure sufficient interaction of the substrate with the coating solution. Then, the substrate is withdrawn at a constant speed, forming a thin layer of precursor solution on the surface. Finally, the solvent evaporates, forming the thin film on the substrate. The coating can be subjected to further heat treatment in order to burn out residual organics.

A large variety of repeatable dip coated film structures and thicknesses can be fabricated by controlling many factors including functionality of the initial substrate surface, submersion time, withdrawal speed, number of dipping cycles, solution composition, concentration and temperature, number of solutions in each dipping sequence, and environment humidity. The dip coating technique forms thin films using self-assembly and the sol-gel techniques. Self-assembly give film thicknesses of exactly one monolayer. The sol-gel technique creates films of increased, precisely controlled thickness that are mainly determined by the deposition speed and solution viscosity.

### Application

- Anti-reflective coatings on windows
- Optical coatings on bulbs, lens
- Optical filters
- Circuit boards
- Semiconductor Wafers
- Photoresist coating
- Sensors
- Field-effect transistor
- LEDs



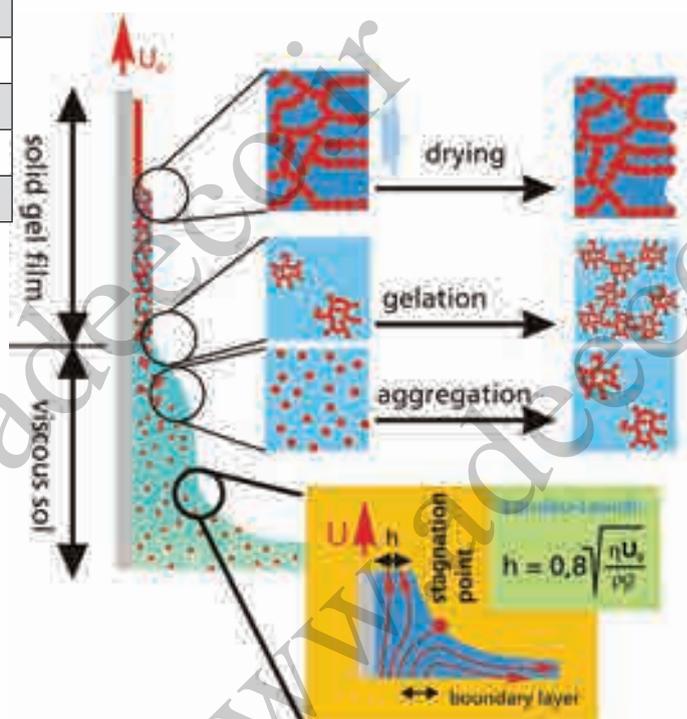
### Comparison between dip coating and spin coating:

Spin Coating	Dip Coating
Coating of one part at a time	many parts can be processed simultaneously
Suitable for low volume operations e.g.: small optical labs	Suitable for high volume operations e.g.: lens manufacturing facilities

Specification	
Motor Power	2.4 KN.m
Accuracy with 25 g Load	6%
Max Load	250g
Speed Monitoring	PLC monitor
Pulling Rate	100-5 mm/min
Effective Height of Pulling	150mm
Max Specimen Dimension HxWxT	3x5x15 cm

#### Advantages:

- Simultaneous coating of top and bottom of parts
- Almost all one-component materials that are able to flow can be processed
- No waste of material
- High output
- Proper coating quality
- Low costs and high productivity



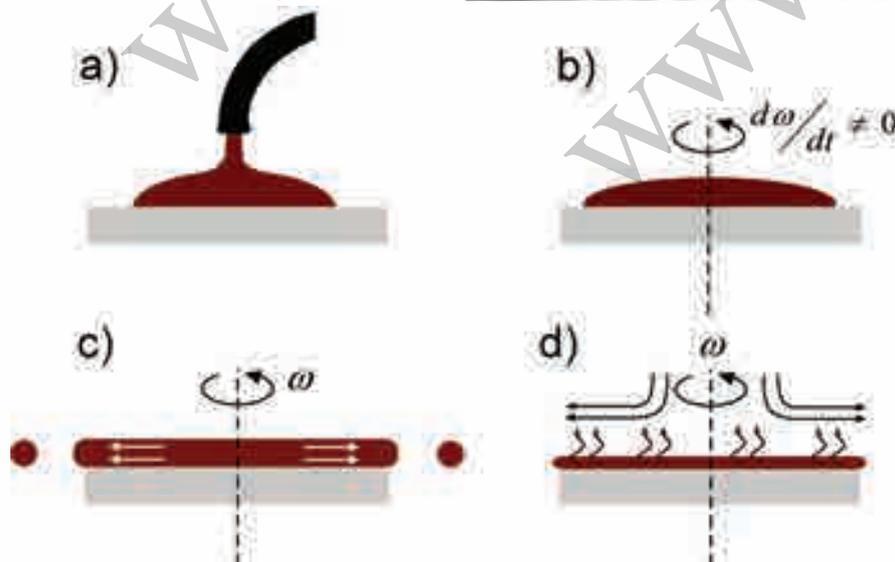
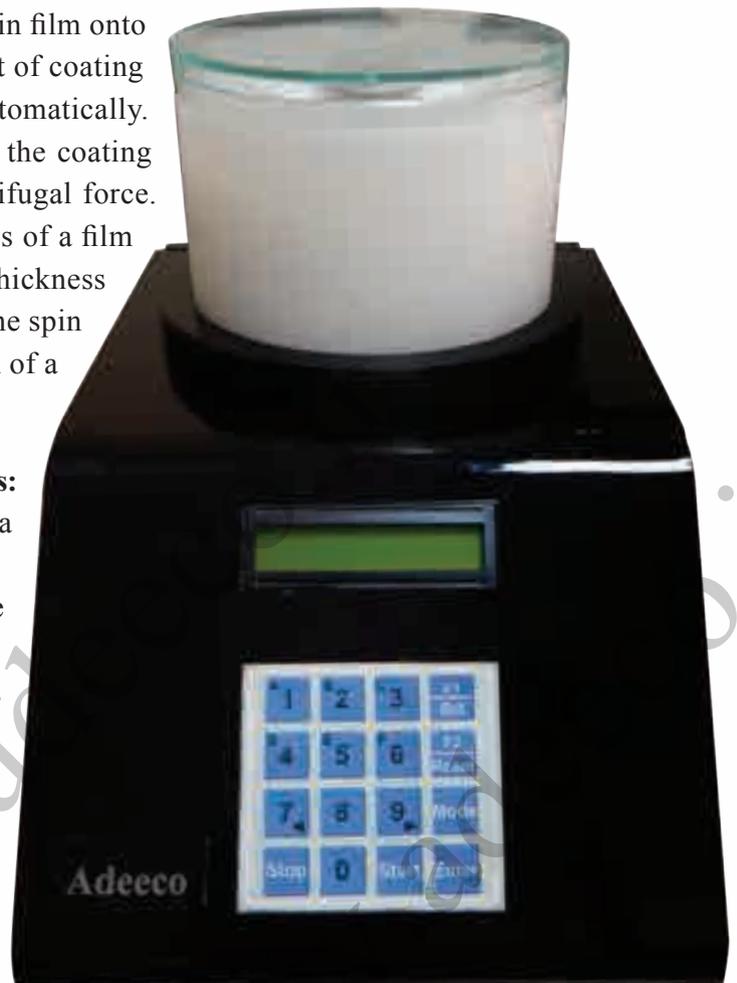
## Spin Coater

Spin coating method is widely used for forming a thin film onto the rotating substrates by applying a specific amount of coating solution manually (e.g. using a syringe) or automatically. Substrate is rotated at high speed in order to make the coating solution spread on the substrate as a result of centrifugal force. The rotation will continue until the desired thickness of a film is achieved. The speed of rotation determines the thickness of coated layer. Keeping the speed constant during the spin coating process, plays a crucial role in the formation of a homogenous layer.

**In other words, spin coating consists of following stages:**

- Deposition of the coating onto the substrate using a nozzle/ spray, etc.
- Acceleration of the substrate rotation speed to the desired level.
- Spinning of the substrate at a constant rate- fluid viscous forces dominate fluid thinning behavior
- substrate spinning at a constant rate - solvent evaporation dominates the coating thinning behavior

Most substrates can be spin processed, including wafers, microscope slides, photomasks.





### Advantages

- Thickness homogeneity
- Short coating times (a few seconds per coating)
- Simple and easy operation
- Minimal edge effect

Specification	
Input Voltage	220 AC
Power DC	24 V
Min Rate	800 rpm
Max Rate	9000 rpm
Rate Tolerance	±30 rpm
Coating Time	Up to 500 s
Dimension	26×38×32 cm
Weight	16 Kg
Monitoring	Digital

Application	
<ul style="list-style-type: none"> <li>• Photoresist layers for patterning wafer in microcircuit production</li> <li>• Insulating layers for microcircuit fabrication</li> <li>• Flat screen display coatings</li> <li>• Antireflection coatings and conductive oxide</li> <li>• DVD and CD ROM</li> <li>• Sensors</li> <li>• Field-effect transistors</li> <li>• LEDs</li> </ul>	



# Electric Muffle Furnace

Indirect fire furnace is used for heating materials and products that produce undesirable by-product in contact of direct flame. Besides, heating at such high temperatures results in corrosive environments which is also Detrimental. In such cases, the furnaces used in the industrial process utilize the carefully insulated containers used for heating food. The materials are put in heat conductive container outside burners and are heated by contact with combustion products.

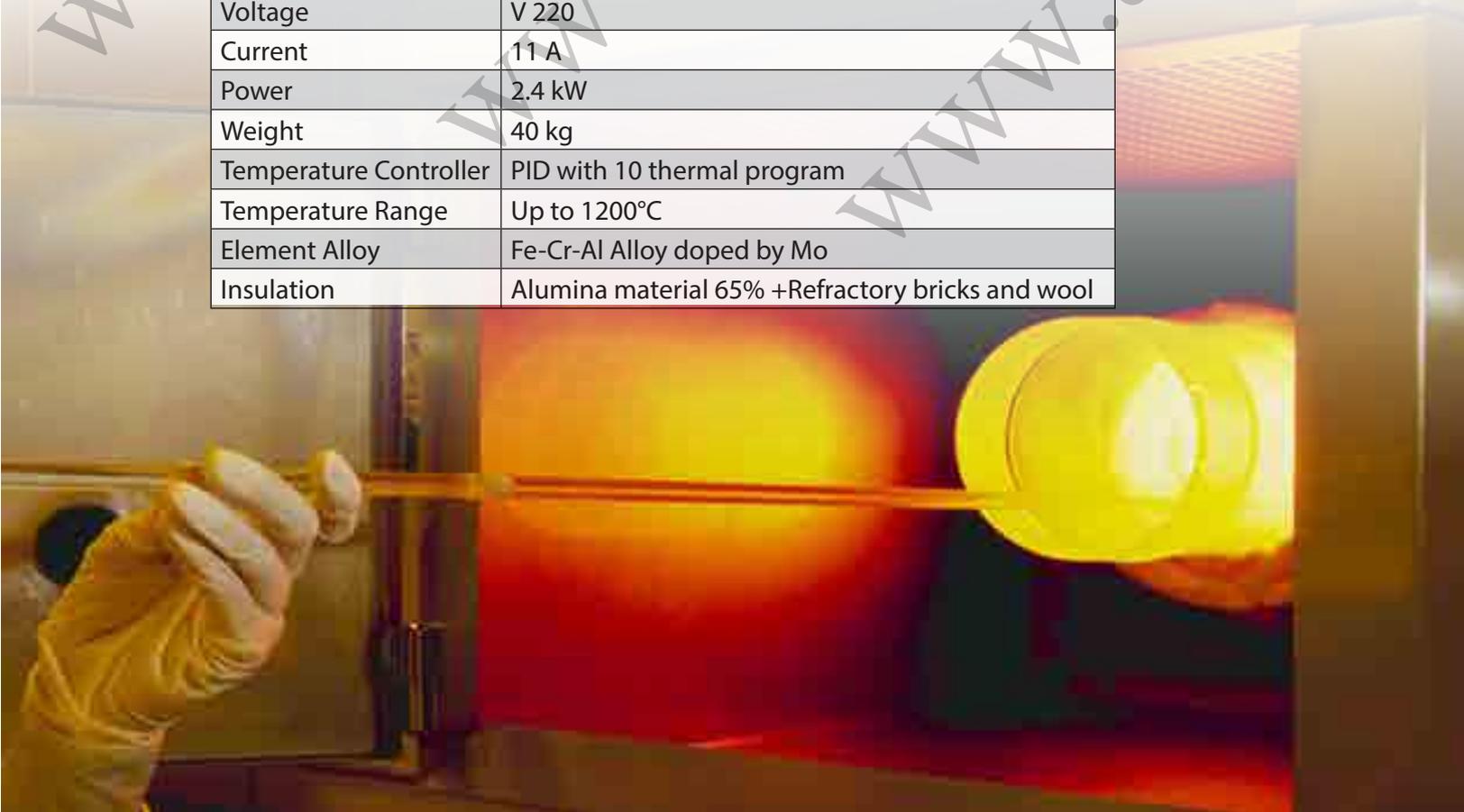


## Application

- Different heat treatments cycles
- Stress relief
- Aging
- Work hardening
- Tempering
- Dissolution
- Carburizing

## SPECIFICATION

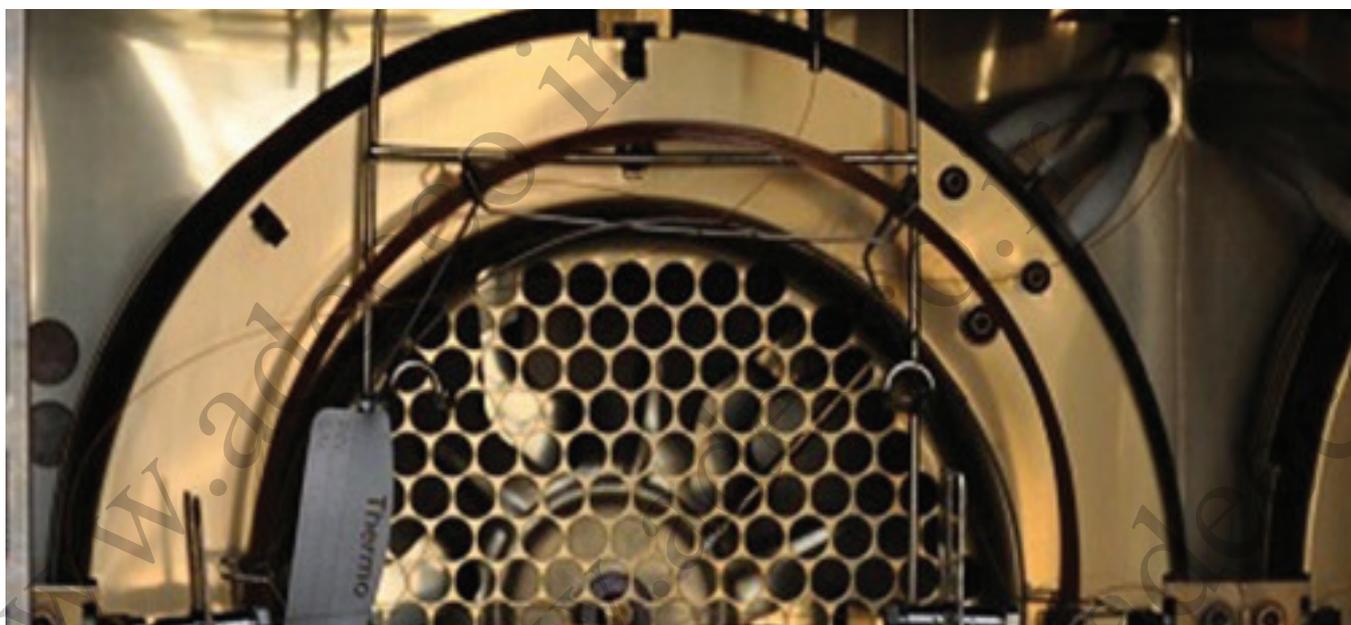
Internal Box Dimension	13×10×20 cm
Volume	2.6 l
Voltage	V 220
Current	11 A
Power	2.4 kW
Weight	40 kg
Temperature Controller	PID with 10 thermal program
Temperature Range	Up to 1200°C
Element Alloy	Fe-Cr-Al Alloy doped by Mo
Insulation	Alumina material 65% +Refractory bricks and wool



## Dual Jet Cryogenic Modulator (2DGC)

Comprehensive two-dimensional chromatography is one of the fast growing techniques for analysis of complex mixtures. «Duojet» is a Comprehensive two dimensional gas chromatograph modulator with the ability to be interfaced to your gas chromatograph which provides reliable two and three-dimensional data from complex mixtures. «Cyrus» and «GC Image» are our offer for data processing of the resulting data.

We can offer our specially designed modulator for any GC you already have in your laboratory and wish to upgrade it to powerful GC×GC.



### Features:

- The Separation Power of GC×GC is considerably higher than conventional 1D capillary GC.
- GC×GC offers better sensitivity than conventional 1D capillary GC due to the focusing effect of the modulation.
- GC×GC generates structured chromatograms which make the technique more suitable for sample screening than conventional 1D capillary GC.
- GC×GC is easy to interface with TOF MS leading to an exceptionally powerful GC/MS system able to separate and identify the most complex mixtures.
- GC×GC reduces the need of complex mixtures preparation procedures as the separation power of the technique is so large that eliminate the interferences critical in conventional GC separations.

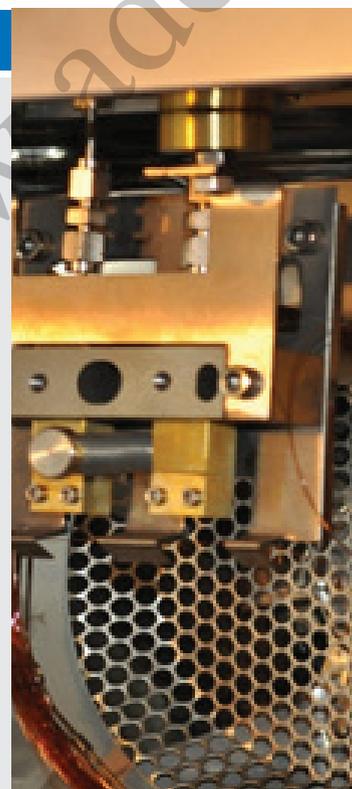


### SPECIFICATION

Cryogenic Modulator	Communication	RS232 Serial Port
	Type	Sequential Dual Jet
	Coolant	Liquid CO <sub>2</sub>
	Refrigerant Flow	Adjustable
	Column Alignment	Mechanical
	Modulation Cycle Time Selection	Adjustable 0 to 60 sec.
	Modulation Start Daley	Yes
	Jet type	Steel pipes with Brass Body, Replaceable
GC control and data acquisition	Depends on GC Type	
2D data processing "GC Image"	Automated Peak Recognition	Yes
	3D Automatic Integration	Yes
	Single or Group Processing	Yes
	Display Selection	Rotation 3D color plot, Apex map, One dimensional chromatogram
	Calibration	Different types of calibration
	Calibration Fit	Linear
	Software Noise Reduction Filters	Yes

### Application

- Petroleum & Petro-Chemical industry
- Compositional characterization of petrochemical fractions
- Group-type and target analyses
- Food & Flavors
- Fingerprint complex essential oils
- Ordered patterns for identification of structurally related compounds
- Enantiomeric recognition of several components in highly complex samples
- Biomedical
- Forensic
- Environmental
- Separation of target compounds from matrix
- Possible reduction in need for sample clean-up procedures
- VOCs Analysis
- PAHs standard mixture
- Geochemistry
- Chemical / Industrial



## Contact Angle Measuring Instrument

Contact angle measurements, dividing into static and dynamic, analyze wettability of plastic, glass, ceramic, paper, wood or metal in addition to coating processes on extremely small surfaces. Static contact angle is measured when droplet is standing on the surface and the three-phase boundary is fixed, in contrast to the dynamic contact angle which is produced while wetting (advancing angle) or de-wetting (receding angle). Static contact angle measurement is often more meaningful for assessing quasi-static processes, e.g. bonding in semiconductor technology, whereas dynamic processes such as coating, are better modelled using dynamic measurements.

There exists another model, high temperature contact angle, which is capable of carrying out measurements in a temperature range from room temperature to 727 °C.

Reliable and accurate contact angle measurements can be achieved with the aid of the fast and high-resolution camera and a user friendly software.

### Application

#### Oil industry

- Studies of wettability of crude oil to the reservoir rock surface

#### Food industry

- Cleanability evaluation of surfaces of packaging materials and process line equipment

#### Pharmaceutical industry

- Studies of stability and solubility of drugs

#### Paper and packaging industry

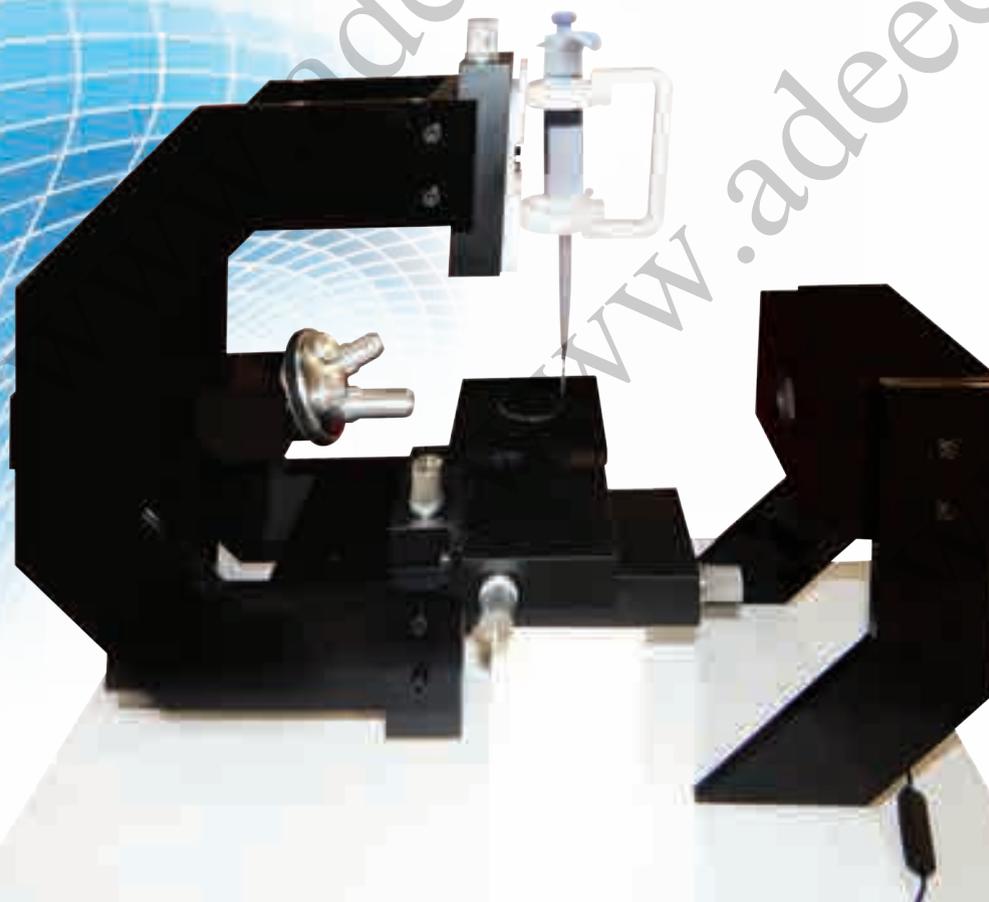
- evaluation of wettability, absorption and spreading of various fluids, such as inks and coatings

#### Textile industry

- Studying the contact angle when developing water repellent clothing

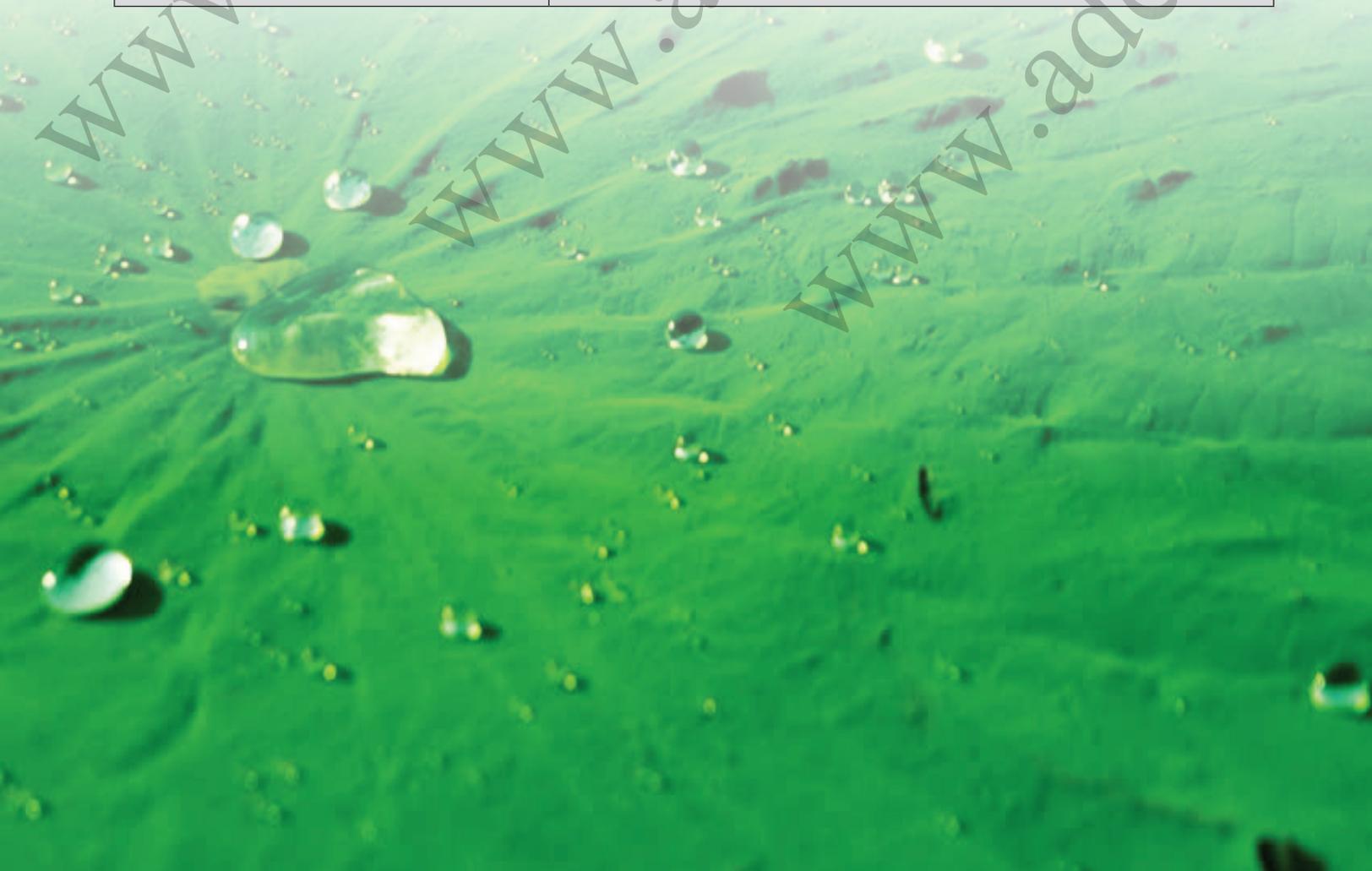
#### Electronic industry

- Evaluation of wettability of solder metals
- Measuring the cleanliness
- Coating homogeneity evaluation





Specification	
Models:	Static/ Dynamic/ High Temperature
Instrument dimensions (LxHxW)	50x40x30 cm
Power Source	5 V – USB port
Working temperature	Room Temperature- upgradable by order
Input	USB Cable
Output	USB Cable
Sample Dimensions (LxW)	3x3 cm
Max Sample Thickness	1 cm
Dosing system	Manual/Automatic
Max volume of drop	up to 8 µlit
Measurement specifications	
Accuracy	0.1°
Range	0 to 180°
Measuring method	Sessile drop
Optics	
Zoom	>20x
Focus	Automatic

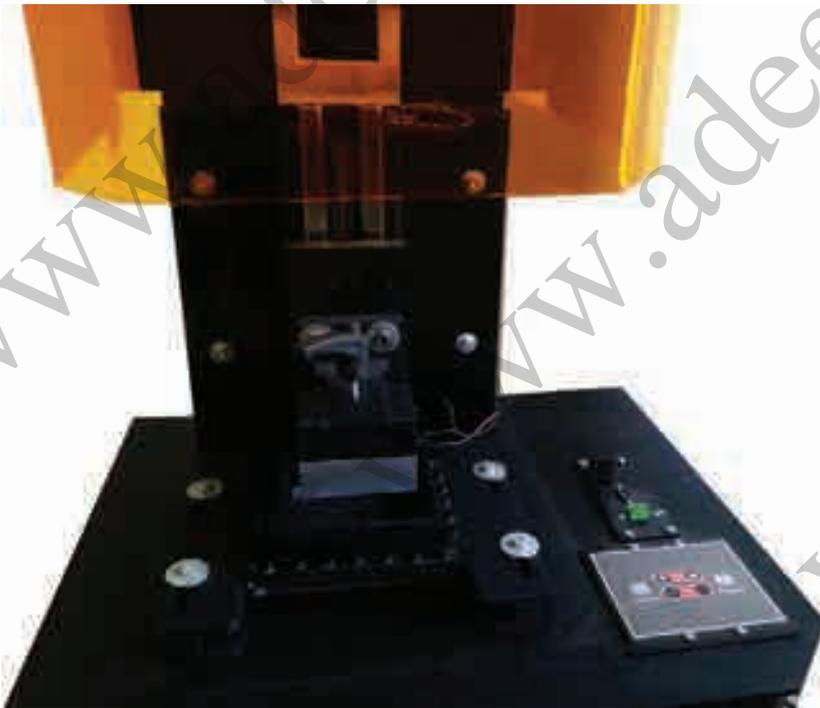


## 3D Printers

Nowadays, 3D printing is known as an economic process of yielding prototypes with a maximum production rate. It is a process of making three dimensional solid objects from a digital file, for instance a CAD (Computer Aided Design). You will have to slice your 3D model before it is ready to be 3D printed which means dividing it into hundreds to thousands of horizontal layers by a software. When the 3D model is sliced, you can upload your file, then the object is ready to be 3D printed layer by layer. The 3D printer reads each slice (2D image) and creates a three dimensional object.

Stereolithography (SLA) and Digital Light Processing (DLP) are considered as the most applicable methods of 3D printing. Both of the processes are based on curing the photopolymer resins by subjecting it into an intense light and the major difference is their light source. The main point about mentioned 3D printing processes is that they require support structures for some parts, specifically those with overhangs or undercuts. Using these processes, one would be able to produce highly accurate parts with excellent surface finish.

Adeeco Company offers several high technology models of 3D printers which are suitable for high accurate activities.



### Application

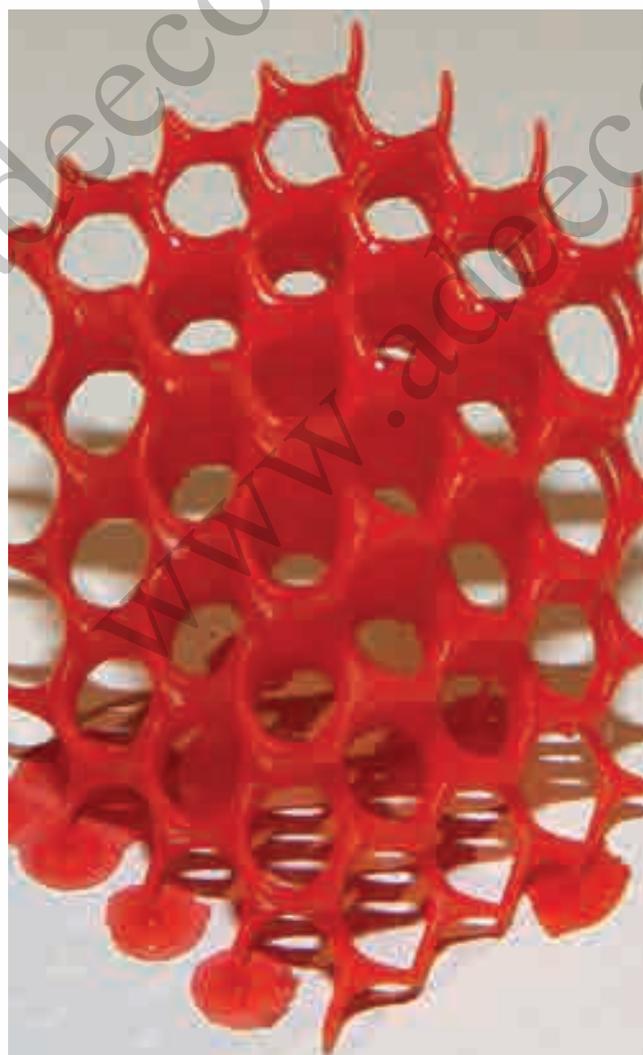
- Automotive industry
- Medical industry
- Aerospace & aviation industries
- Jewelries
- Decoration
- Toys

### Advantages

Stereolithography (SLA)	Digital light processing (DLP)
excellent surface finish	Higher resolution
most accurate 3d printing process	Less running time (faster than SLA)
	less waste
	lower running costs

### Specifications

Model	Pro	Economic	Microtech	SLA
Print technology	DLP	DLP	DLP	SLA
Build envelope (cm)	19.2×10.8×20	8×6×10	3×2×10	14.5×10×20
Machine dimensions (cm)	50×37×150	50×37×70	50×37×100	50×37×160
Projector resolution	1920×1080	1024×768	1024×768	Galvo scanning system
Lateral resolution (μm)	100	50-80	10-30	150
Layer Thickness (μm)	12.5	25	6.25	100
Sidelong computer	Yes	Yes	Yes	Yes
Weight (Kg)	50	35	40	50
Material	UV cure resin	UV cure resin	UV cure resin	UV cure resin
UV source	UV Lamp	UV Lamp	UV Lamp	Laser



# Atomic Force Microscope (AFM)

Atomic Force microscope is one of the most versatile and powerful microscopy technologies for studying samples at nanoscale which makes it applicable in the field of nanoscience and nano-based industries. These microscopes are designed with the latest known AFM-Modes and most developed hardware and software.

## Features

- Different Data Channels Including Amplitude, Phase, Topography
- High Sampling Rate and Digital Filtering Implementation
- High Bandwidth Sensors and High Quality Nano Scanner
- Disturbance and Noise Rejection through Closed Loop Operation

## Some of the adjustable parameters are as below:

- Scanning speed & range
- Angle of scanning
- Reference force
- Proportional & Integration coefficients of PID control
- Dithering amplitude and frequency in dynamic mode
- Scanning selected zoomed area on previously obtained images
- Slope coefficient

## Advantages:

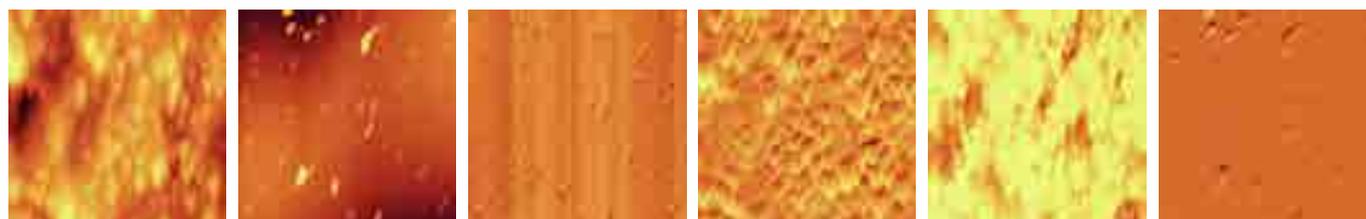
- Operation under non-vacuum conditions
- No need of sample preparation
- Reasonable cost, low energy consumption
- Not limited to specific kind of samples in comparison with TEM, STM and SEM
- Being a right-size laboratory equipment
- Proper imaging technique of biological samples

## Application

- **Quality Control**  
Inspection of microelectronic products  
Quality control of coated surfaces
- **Environment and Food Sciences**  
Nano filter evaluation
- **Polymers and Coatings**  
Surface morphology of polymeric films  
Evaluation of polymerization process
- **Physics**  
Smoothness evaluation of optical surfaces in optic industry  
Magnetic and Electrical properties of materials
- **Material Science**  
Morphological evaluation of different specimens  
Measuring the average particle size of powders  
Creep crack analysis  
Surface roughness analysis
- **Specific Application**  
Nano lithography  
Nano machining of hard ceramic surfaces
- **Medical and Biological Sciences**  
pharmaceutical manufacturing  
Imaging of DNA, RNA, chromosome, cell membrane, bacteria and ...

### Specification

Model	Multi-Mode AFM	Bio-AFM	Nano Vac	High speed AFM	Educational AFM
Head	H-M11	H-M21	H-A11	H-M11	H-M11
Scanner	S-C2	S-NC2	S-C2	S-C2	S-C1
Controller	C-2MS C-2MA C-2MF C-2MFP	C-2BFP	C-2NFP	C-2HFP	C-2ES
Option	High speed module, Motorized head H-A11, S-C3, S-C4, S-C5	High speed module	High speed module, Motorized head H-A11, S-C3, S-C4, S-C5	Motorized head H-A11, S-C3, S-C4, S-C5	Motorized head H-A11
Optical microscope		Included inverted microscope			
Vacuum pump			Compatible with well-known pump e.g. Leybold TriVac		
Vacuum gauge			Compatible with well-known gauge e.g. Leybold Pirani gauge		



**Head:**

Model	H-M11	H-A11	H-M21
Optical Adjustment	Manual	Auto	Manual
Approach method	Auto/Manual	Auto/Manual	Auto/Manual
Top view camera	20X up to 200X zoom	20X up to 200X zoom	20X up to 200X zoom

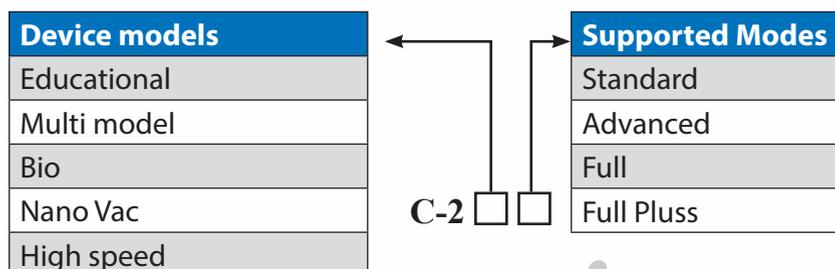
**Scanner:**

Model	S-C1	S-C2/S-NC2	S-NC3	S-C4	S-C5
Scan range XY	30 $\mu$ m	50 $\mu$ m	80 $\mu$ m	50 $\mu$ m	80 $\mu$ m
Scan range Z	3.5 $\mu$ m	3.5 $\mu$ m	3.5 $\mu$ m	7 $\mu$ m	7 $\mu$ m
Resolution XY	2 nm	1 nm	1 nm	1 nm	1 nm
Resolution Z	0.3 nm	0.1 nm	0.1 nm	0.1 nm	0.1 nm
XY sample movement	6.5 mm	6.5 mm	6.5 mm	6.5 mm	6.5 mm
Max sample thickness	7 mm	7 mm	7 mm	7 mm	7 mm



### Controller:

The features of various models of controller are as follows:



### Software:

Number of scanning channels	Up to 8
Number of points per image	Up to 1024×1024
Number of points per spectrum	Up to 1024
Angular scanning	Available
Resume scan	Available
Oxidation lithography	Available
Multi-scan	Available
Operating system	Microsoft windows XP, Windows 7, Windows 8, Windows 10

### AFM working modes:

Functional Modes	Standard	Advanced	Full	Full Plus
Contact (Static, DC)	✓	✓	✓	✓
Non-Contact (Dynamic, AC)	✓	✓	✓	✓
Tapping (Semi-Contact, Intermittent-Contact)	✓	✓	✓	✓
Lateral Force Microscopy (LFM)	✓	✓	✓	✓
Magnetic Force Microscopy (MFM)		✓	✓	✓
Electric Force Microscopy (EFM)		✓	✓	✓
Force Spectroscopy		✓	✓	✓
Chemical Nano-Lithography			✓	✓
Mechanical Nano-Lithography			✓	✓
Force Modulation Microscopy (FMM)			✓	✓
Kelvin Probe Force Microscopy (KPFM)				✓
Conductive AFM (CAFM)				✓
Piezoresponse Force Microscopy (PFM)				✓
Frequency Modulation (FM)*	*Only available in NanoVac			

# Catalyst Characterization Analyzer- BET

Catalyst Characterization Analyzer is an automated chemisorption's analysis instrument. which is capable of evaluation of a variety of catalyst properties including:

- B.E.T. Surface Area
- TPD: Temperature Programmed Desorption
- TPR: Temperature Programmed Reduction
- TPO: Temperature Programmed Oxidation
- Pulse Titration

Straight forward operation, PC interface and accessibility of controllers make it an ideal choice for routine metal area/dispersion measurements in industries, universities and colleges. This device is one of the most commonly used device for determination of nanostructured materials properties such as metallic nanoparticles, metallic oxides, sulphureous oxides, nanotubes, and other nanostructures.

The most important characteristics of the materials which can be measured by this device are BET Surface area, adsorptive properties of nanoparticles, reduction properties of metallic nano oxides, and reaction parameters such as activation energy. One of the advantages of this device is its ability to be connected to other detectors, which provides the use of complementary and precise spectroscopic methods.

## Features:

- High-precision electronic mass flow controllers provide extremely accurate gas control and determination of gas volume.
- A highly sensitive linear micro volume thermal conductivity detector (TCD) assures that the volume calibration remains constant over the full range of peak amplitudes so the area under the peak is directly proportional to the volume of gas reacted.
- Cylindrical furnace can heat the quartz sample reactor to 1100°C. Any number of ramp rates and sequences facilitate customized experiments.
- Five gas inlets provide the capability to perform sequential experiments, such as TPR/TPD cycles.
- Low internal plumbing volume assures high resolution, fast detector response and reduces error when calculating gas volumes.



## Application

### Pharmaceutical industry

- Characterization of pharmaceutical products performance

### Cement industry

- determination of the inner surface of hardened cement paste

### Oil and gas industry

- Evaluation of gas storage materials like Activated carbon/Hybrids
- Study of Zeolitic Materials utilized as adsorbents/catalysts for oil refining

### Catalytic processes

- Catalytic Reforming
- Hydrocracking, Hydrodesulfurization (HDS), hydrodenitrogenation (HDN)

- Mass spectrometer port and software integration allow virtually simultaneous detection of both the thermal conductivity detector and mass spectrometer.



Catalysts



SEM of Zeolites

Active Carbon + Zeolites

Catalysts

### SPECIFICATION

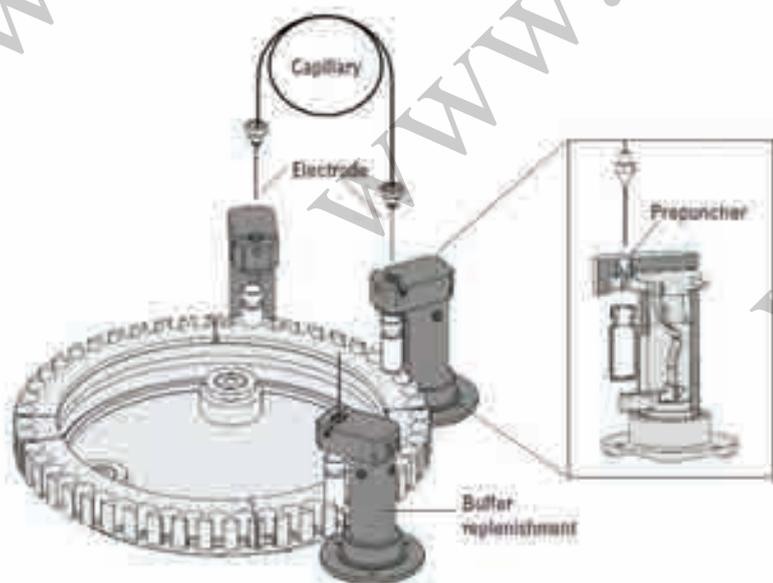
Capability	B.E.T. Specific Surface Area
	Temperature Programmed Oxidation, Desorption and Reduction (TPO-TPD-TPR) (Pulse Titration)
Performance	Specific Surface Area > 0.001 m <sup>2</sup> /g
	Accuracy, Volume: ± 1%
	Reproducibility: 0.5%
Gases	compatible with: H <sub>2</sub> , O <sub>2</sub> , CO, CO <sub>2</sub> , NO, N <sub>2</sub> O, NO <sub>2</sub> , SO <sub>2</sub> , NH <sub>3</sub> , N <sub>2</sub> , Ar, Kr, He
	Gas Flow Rate : 0-20 sccm
	Input Pressure (gauge): Up to 2 bar
	Gas Lines: 1/8", Stainless steel
Power	Voltage: 115- 230 V
	Frequency: 50/60 Hz
	Power: 1800 W
Heating System	Mantle, Max Temp : 450 °C- Furnace, Max Temp: 1100 °C
	Mantle Power: 500 W- Furnace Power: 800 W
	Controller Type : PID via PC
	Program Steps : Multiple Ramp, hold (soak)
	Furnace Heating Rate: 1-20 °C/min
Environmental	Ambient Temperature: 15-50 °C
	Relative Humidity: 20-80%
Hardware	Micro Volume Thermal Conductivity Detector: Dual-filament
	TCD Filament Material: Oxidation and Ammonia Resistant
	Filament Type: Nickel-Iron
	Gas Input Ports: 5 ports
	Loop Volume: 500 µL
	Mass Flow Controller: Two MFCs with flow rate of 0-20 sccm

# Capillary Electrophoresis

Capillary electrophoresis (CE) is a separation and analytical method in which the differential migration rates of sample components which is caused by an applied electrical field within a small-diameter polyimide coated fused silica capillary tube are measured. “On-column” UV spectrometric or fluorescence analysis is usually used for detection of sample components through a “window” in the capillary electrophoresis.

The versatility of CE is partially originated from its various modes of operation. Based on the separation mechanism, the main modes encompassed by CE include:

- Capillary Zone Electrophoresis (CZE)
- Micellar Electrokinetic Chromatography (MEKC)
- Micro-Emulsion Electrokinetic Chromatography (MEEKC)
- Capillary Gel Electrophoresis (CGE)
- Capillary Isoelectric Focusing (CIEF)
- Capillary Isotachopheresis (CITP)
- Capillary Electrochromatography (CEC)



## Application

- Chemical industry
- Food analysis
- Pharmaceutical analysis
- Bio analysis
- Environmental pollutants analysis
- Nanomaterial analysis



### Features:

- High separation efficiency
- Short analysis time
- Low sample and electrolyte consumption
- Low waste generation
- Under friendliness complete control of the instrument using a PC
- Increased flexibility in performing analysis of various complexity
- Any kinds of complex runs are possible including those with pre-programming of changes in analysis's condition
- Customized report, data export to other programs

### Software Features:

- Real time electrophoregram visualization
- Electrophoregram data processing
- Computation of electrophoresis system parameters
- Customized report output (hard copy and file), data exchanges with worksheets, data bases and word processors

### SPECIFICATION

SPECIFICATION	
Power Voltage Range	Settable 0 to +25 kV supply (Operation under constant voltage)
Pressure System	Programmable :0–100 mbar for injection, 1 bar for Washing and Flushing
Autosampler	16-position carousel. All vials are randomly accessible from electrodes end of capillary
Vials	100 µl sample vials, 1 ml or 2 ml buffer vials (polypropylene or glass) with resealing snap caps
Detector	Real time UV-Visible detector (200–900 nm)
Light Source	Halogen/Deuterium lamps
Analysis	Current 0 to 300 mA
Safety Features	Low current limit, safety sensors at door and cover disabling high voltage diagnostic function

# Electrospinning

Nanofiber Electrospinning unit is a system for producing ultra-fine fiber with the diameter of 50-1000nm. The nanofiber has very high specific surface area and small diameter. The process uses electrostatic and mechanical forces to spin fibers from the tip of a fine spinneret. The spinneret is maintained at positive or negative charge by means of a DC power supply. When the electrostatic repelling force overcomes the surface tension force of the polymer solution, the liquid spills out of the spinneret and forms an extremely fine continuous filament.

This device is an easy-to-use model of electrospray deposition (electro spinning) equipment with fundamental functions and low price. This simple equipment makes samples in various sizes and purposes and is suitable for the experiment of a thin film, nano coating, nano fibers, and pattern.

## Features:

- Various polymers and composites have the potential to be electrosun.
- Different product specifications such as porosity, morphology, diameter, and ability to load beads can be obtained.
- The process is easy and economical.
- Various types of polymers such as synthetic, biodegradable, natural polymers and/or polymer/composite may be processed.
- Aligned nanofibers can be produced by high speed rotating collector or using wire type collector.



## Application

### Textile industry

- Textile manufacturing

### Biomedical Science

- Filtration
- Artificial organ components
- Tissue engineering
- Implant materials
- Drug delivery
- Wound dressing
- Medical textile materials

### Composites

### Energy

- Energy storage
- Solar cell and fuel cell electrodes
- Electrodes of Li-ion batteries

### Chemistry

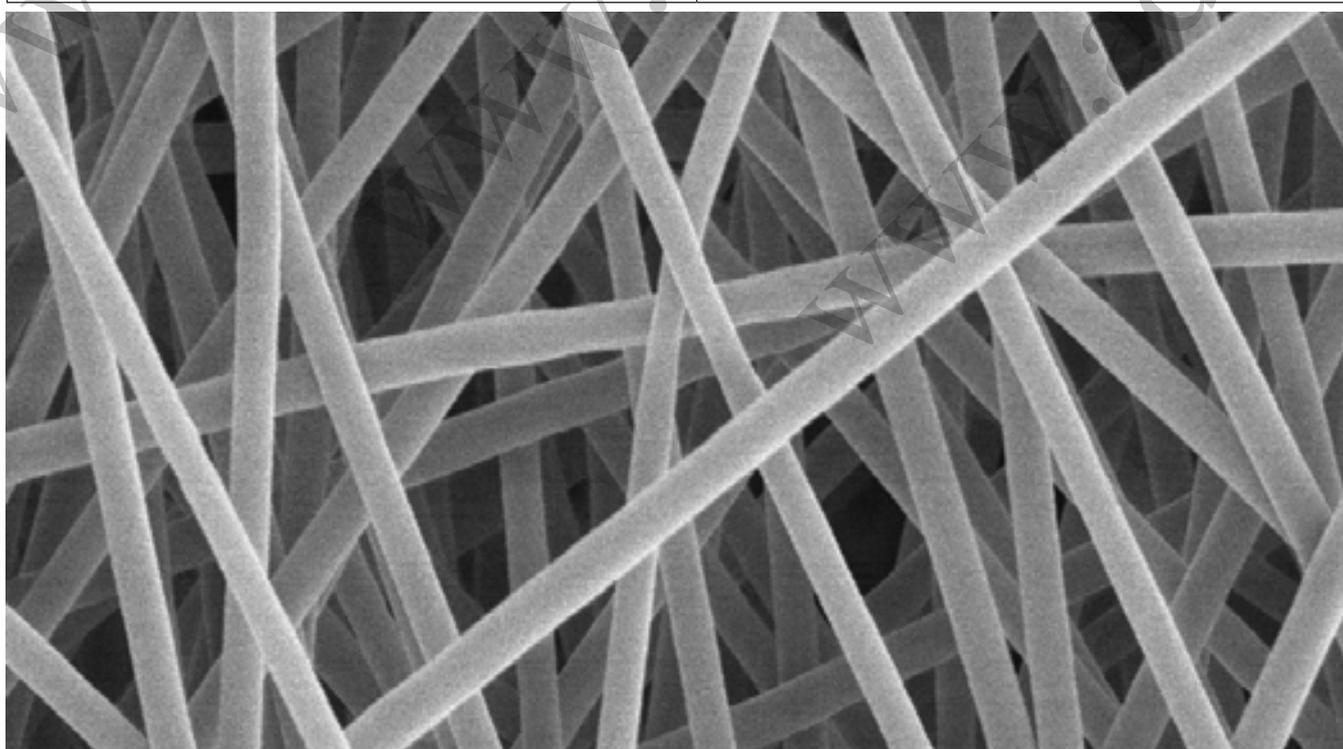
- Catalyst and enzyme carriers

### Electronic/Optoelectronic

- Sensors
- Photoluminescence
- Super capacitors
- Actuators

## SPECIFICATION

Model	Single Pump, Dual Pump, Pilot
Dimensions	70x70x60 cm
Weight	80 kg
Power Requirements	200-240 V AC, 50/60Hz, single-phase 5A
<b>Spinnerets</b>	
Number of Attachable Needles	2
Electrospinning Distance	5-17 cm
Spinneret Scanning Rate	0-30 mm/s
Motion Range (spinneret position)	0-30 cm
Syringe Pump Polymer Solution Injection Rate	0.01 – 500 ml/h
Modes of Operation	Constant Flow Rate and Volume Dispense
<b>Collector</b>	
Drum Rotation Speed	0-3000 rpm
Length of Drum	30 cm
Drum Diameter	8 cm
Collector with Minus Voltage up to -20 kV (optional)	
High Voltage	0-35 KV DC, Positive Polarity, Precise Adjustable
Digital Voltage Monitoring	
Heating System	room temperature to 45°C



# Gas Sensor and Catalyst Testing System (GSCTS)

Gas sensor interacts with a gas to measure its concentration. Each gas has a unique resistance, conductivity and breakdown voltage and the electric field at which it is ionized. Sensor identifies gases by measuring these characteristics.

This device is manufactured by integration of two devices: Catastest (for Heterogeneous Catalyst's performance measurement) and semi conductive sensor's performance tester. It can well satisfy the semi conductive sensor's research center supplies. It is a qualified device for use in laboratory which investigates the synthesis and evaluation of the heterogeneous catalysts.

Since optimization of sensitive materials in semiconductor sensors are linked to the performance of the catalyst, this equipment is able to simultaneously measure sensor performance and catalytic properties of material.

### Features and facilities:

- Gas flow controller
- Automatic and manual control valves
- Accurate fluid injection pump
- Manual and automatic control of flow
- Max furnace temp: 1000°C
- Temperature controllers
- Gas injection port
- Reactor chamber and sensor holder
- Catalytic reactor
- Humidity controller
- Software for data and signal collection

### SPECIFICATION

Resistance	$5 \times 10^2 - 5 \times 10^{10} \Omega$
Gas Concentration	0.1 – 10000 ppm
Gas Flow Rate Control	1 ml/min
Fluid Flow Control	1 $\mu$ l/h
Temperature Control	0.1 % Accuracy
Dimension	80cm×90cm×50cm

### Application of Gas Sensor

- Process control industries
- Environmental monitoring
- Boiler control
- Fire detection
- Alcohol breath tests
- Detection of harmful gases in mines
- Home safety
- Grading of agro-products like coffee and spices

### Applications of Catalyst Performance Test:

- Hydrocarbon partial Oxidation
- Fuel Cells
- Catalytic Cracking
- Hydrocracking, Hydrodesulfurization, and Hydrodenitrogenation Catalysts
- Fischer-Tropsch Synthesis
- Isomerization
- Catalytic Reforming



## Syringe Pump

- Syringe pumps provide liquid handling products for accurate delivery of fluids for a multitude of syringe pump applications. This equipment includes three models of HPM, HSM and HOM series, the characteristic features of which are listed below:
- HPM and HSM series are programmable models, by which one can infuse/withdraw fluids using advanced programming functions.
- HSM series are remotely controlled which is of great significance while working in hazardous environment and it is safe for researcher to be far from pumping apparatus.
- HOM series are the best choices for operators who demand for accurate, low rate infusion without withdrawal and programming capabilities.

### Application

- Infusing reactant into a reaction chamber
- Animals infusion
- Cellular infusion
- Electro spinning/Melt spinning
- Lab-on-chip





Model	2000HSM	2000HPM	2000HOM	1000HSM	1000HPM	1000HOM
Body	Metal	Metal	Metal	Metal	Metal	Metal
Max. Syringe No.	10	10	10	2	2	2
Display (line*character)	4x20	4x20	4x20	4x20	4x20	4x20
Internal Programming	•	•		•	•	
Computer Control	•			•		
Autofill	•	•		•	•	
Max. syringe size (ml)	50	50	50	60	60	60
Min. injection rate (µl/h)	0.5	0.5	0.5	0.5	0.5	0.5
Max. injection rate (ml/h)	640	640	640	1000	1000	1000
Pedal resolution per step (nm)	20	20	20	20	20	20
Weight (kg)	4.5	4.5	4.5	4	4	4

### Features

- Holds syringes from 0.5 µl to 60 ml
- Permanent memory: Stores last-used Settings
- Infusion and withdrawal
- Full metal chassis
- Advanced microstepping techniques
- Easy to use interface
- Two modes of operation: Constant rate, Constant volume

# High Voltage Power Supply

Due to the high voltage suppliers' flexibility, they could be used in a wide range of application. They have various capabilities, the most important of which is PC connectivity and being programmable. These products are designed in a way that minimize the electric shock.



## Models of high voltage supplier

- OV series only have output voltage indicator (Accuracy=0.1 kV).
- OC series have output high voltage indicator (Accuracy=0.1 kV) and output current display.
- D-RC series have a digital port by which the system is controlled.

Digital series consist of digital volume, voltage stabilizer, earth detection system, arc detection system, current limiter and digital screen to monitor the current and voltage. These systems are also equipped with a USB port for connecting to computers and a software for plotting the voltage and current graphs.

## Application

- Capacitor testing
- Free electron laser
- Ion implantation
- Physical vapor deposition
- Capillary electrophoresis
- Electrospinning
- Ion beam assisted deposition
- Ion sources

### Specification

Models	HV35P OV	HV35P OC	HV35P D-RC	HV50P OV	HV50P OC	HV50P D-RC	HV75P OV	HV75P OC
Voltage (V)	35	35	35	50	50	50	75	75
Voltage display	•	•	•	•	•	•	•	•
Current display		•			•			•
PC connectivity			•			•		

### Capability

- Current control system: When current exceeds the value set by operator, voltage would be disconnected automatically (D- RC series)
- Controller: The USB ports control the voltage output.
- Software: Windows -based software (D- RC series)
- Input voltage: 180-240 V, Single-phase, 50-60 Hz
- Output voltage: Up to 100 kV
- Power: 35 and 70 W
- Temperature: -5 to 45 °C
- Polarity: Available either positive or negative
- Dimension: 11×30×34 cm , 11×30×38 cm



# Membrane Gas Separation and Permporometry System (MGSPS)

The membrane industry is one of the growing ones in the field of gas separation which is the key sectors of various industries including petroleum, petrochemical and natural gas industries. Permporometry is a method by which the characteristics of the interconnecting active pores of membrane that are responsible for the actual membrane performance, can be measured. Permporometry is a relatively new characterization method to evaluate the active pores of membrane. It is based on the controlled stepwise blocking of pores by condensation of a vapor, present as a component of a gas mixture and the simultaneous measurement of the gas flux through the membrane. MGSPS device as the first Iranian apparatus for testing the membrane, has taken a major step in meeting the membrane industry requirements.



## Features and facilities:

- Gas flow controller
- Electric and manual control valves
- Manual/ automatic control of flow
- Max furnace temp: 500°C
- Temperature controllers
- Cold trap chamber
- Babbler flowmeter
- Back pressure regulator
- Saturator
- Pressure monitoring
- Membrane processes test module
- Pressure transducer

## Capability

- Gas separation membranes.
- Review and analysis of the gaseous component in feed gas penetration, and exhaust
- The ability to combine various amounts of gases using MFC
- Separation measurement at various pressures
- Equipped with oven and temperature controller
- Used for tubular microporous membranes, mesoporous membranes
- Measurement of pore size distribution of all kind of porous membrane
- Capable of working at low pressure

## SPECIFICATION

SPECIFICATION	
Membrane Test	Max Pressure:7 bar - Max Temperature: 500°C
Permporometry Test	2-50 nm
Dimension	80×45×80 cm

# Nano Cavitation

Adeeco introduces nano cavitation Technology for the process industries. The flow reactor design represents a unique innovation in the process engineering space, enabling low-cost, highly tunable, continuous-flow, physical and chemical, liquid mediated nano cavitation processes.

The concept evolves from a conventional single-channel flow reactor, such as emulsification processors or cavitation cell disruptors, providing high fluid volume throughput, with balanced exposure to the entire reaction medium, via multiple controlled nano cavitation zones.

Reaction mixture is pumped into a lower holding chamber where it gets evenly exposed to high energy nano - cavitation in the multitude of parallel channels. The processed reactants flow up to the upper holding chamber through the outlet nozzle, all this operation can be done in totally gas-tight sealed environment.

### Advantages:

- Highly energy-efficient nano-cavitation in a continuous flow reactor
- Ability to scale outward to industrial processing rate with minimal design complexity
- Facility for multiple thermal zones, enabling unique new reaction processes

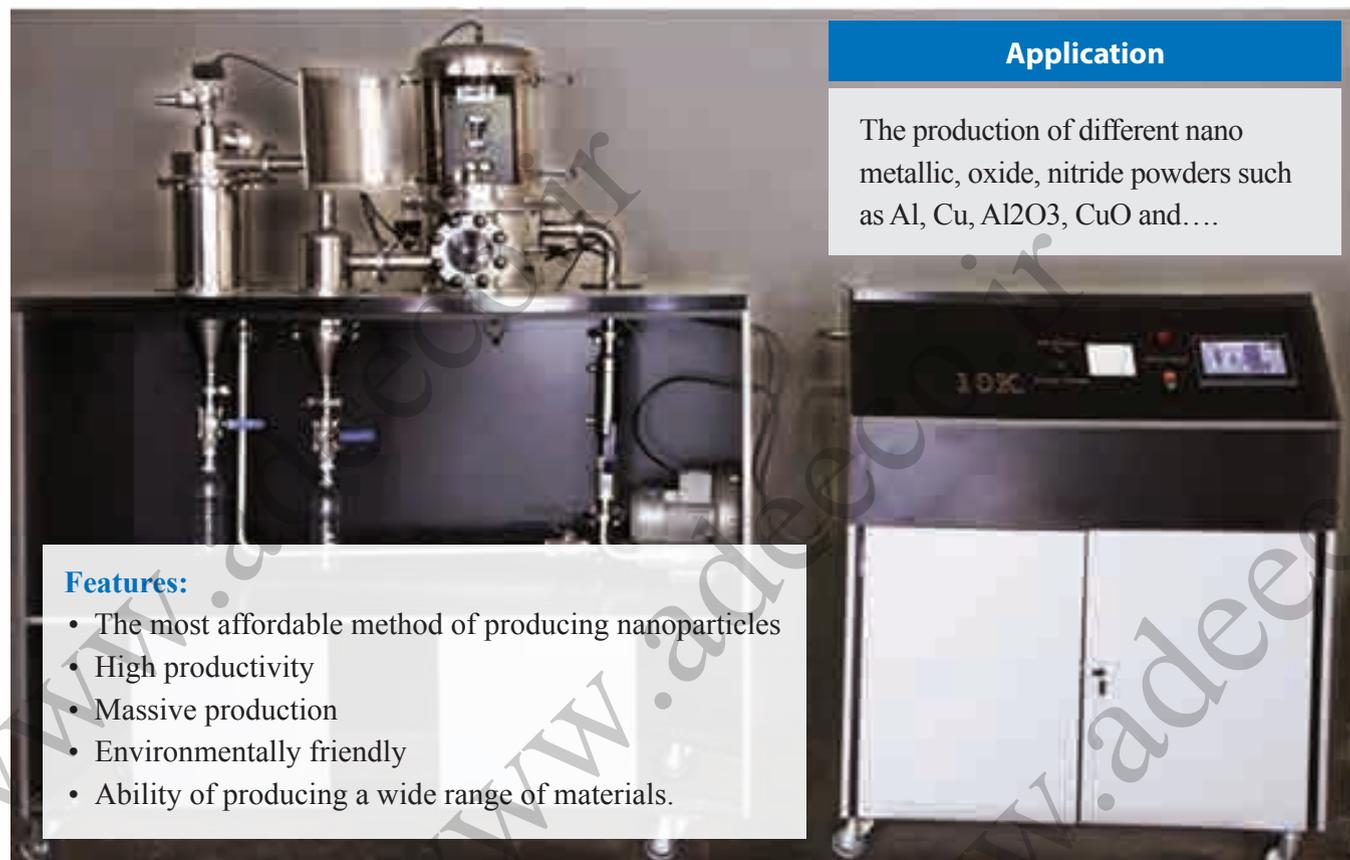
### Application

- Multiphase reaction
- Precious metal catalyst
- Enhancement of liquid-liquid Extraction processes
- Biodegestate disintegration for increased biogas generation
- Foam reduction in fermenters
- Chemical / biocide reduction in cooling towers
- Degassing of viscous fluids
- Herbal and aroma extraction
- Biodiesel transesterification
- Waste water treatment, including sludge disintegration
- Catalyst manufacture via
- Nanoparticle generation
- Nano-milling of pigments in
- Paint manufacturing

Specification				
Model	Bench Top	High capacity Bench Top	Laboratory Scale	Semi Industrial Scale
Capacity	500 cc	3 liter	5 liter	10 liter
Main pump flow	Up to 50 bar	Up to 50 bar	Up to 50 bar	Up to 50 bar
Structure	S.S 304	S.S 304	S.S 316	S.S 304
Power	2 kW	2.5 kW	8 kW	12 kW
Dimension	85×60×65 cm	70×50×50 cm	120×70×100 cm	150×70×170 cm

## Pulse Electrical Explosion Maker (PEE)

Pulse Electrical Explosion maker employs high electric voltage and current to produce metallic and metal oxide nanoparticle in a gas media. The primary bulk wire is converted into the nano powder via explosive process. In this technology, any type of thin conductive wire can be transformed into nano particles.



### Application

The production of different nano metallic, oxide, nitride powders such as Al, Cu, Al<sub>2</sub>O<sub>3</sub>, CuO and....

### Features:

- The most affordable method of producing nanoparticles
- High productivity
- Massive production
- Environmentally friendly
- Ability of producing a wide range of materials.

### SPECIFICATION

		10K	50K
Model		10K	50K
Input Power		1P220V AC	3P 220V AC
Output Voltage		8-10 KV DC	20-50 KV DC
Power Consumption		3 KW	10 KW
Shot Period		1-5 sec	1-5 sec
Wire	Max Diameter	0.25 mm	0.8 mm
	Exploding Length	3-8 cm	10-30 cm
Input Wire		Most of conductive metal	
Production Rate		20 g/hr	150 g/hr
Average Particle Size		<100 nm	
System Weight		200 kg	800 kg

## Plasma Nano Colloid Maker (PNC)



Plasma Nano Colloid maker (PNC) is utilized to produce a wide range of metallic Nano-Colloids through under water wire explosion process. Average particle size of nanoparticles produced by this method is less than 100 nm. In this method, the parameters such as concentration of nano particles in liquid, type of surface treatment and additives can be controlled.

### Features:

- A wide range of liquid media including water, alcohol, glycerin and etc. can be applied
- Excellent dispersion of metallic nano particles
- Ability of production on a laboratory scale with different concentrations
- Environmentally friendly
- High productivity

### Capability

The production of a wide range of nano colloids with different concentration in various media.

Specification		
Model	PNC 1k	PNC 1k- Touch
Output voltage	300-500 V	300-500 V
Input power	1P 220 VAC 500 W	1P 220 VAC 500 W
Shot period	1-5 s	1-5 s
Wire	Max. diameter	0.25 mm
	Exploding length	1-5 mm
Output wire	Any conductive metal	Any conductive metal
Particle size, Average	80 nm	80 nm
Control system	PLC	PLC & Touch panel
System weight	35 kg	45 kg

# Scanning Probe Microscope (AFM/STM Modes, all in one system)

SPM series have gained worldwide popularity through its affordability, portability, and ease of use, with hundreds of systems currently in use. SPM is now united these three unique characteristics with a fully modular system design.

Featuring an innovational ergonomic design and improved electronics, this scientific microscope delivers atomic scale resolution at a remarkably affordable price, making it an ideal choice for education as well as research.

The SPM offers educators an exceptional opportunity to teach their students many powerful SPM/AFM-STM techniques.

## Features:

### AFM Mode:

- Contact Mode (Constant Force and Constant Height Available)
- Non contact Mode
- Semi contact Mode
- Force Spectroscopy
- Lithography (Chemical and Mechanical)
- LFM (Lateral Force Microscopy)
- MFM (Magnetic Force Microscopy)
- EFM (Electrostatic Force Microscopy)
- PDM (Phase Detection Microscopy)
- FMM (Force Modulation Microscopy)

### STM Mode:

- Constant Height
- Constant Current
- Lithography
- Spectroscopy

### Advantages:

- Cost-effective platform offers simple upgrade path
- Excellent educational instrument with course curriculum

## Application

- All kind of samples including biological and non-biological samples
- Atomic scale imaging of solid surfaces
- Atom and nano structure manipulation
- Spectroscopy of samples at desired point
- In almost all field of Nano technology, Optoelectronics, Surface Materials, Semiconductor and Chemistry, Solid state Physics, Biology, Medicine,...



### Specification

Range of Scanning X,Y	30 $\mu\text{m}$
Range of Scanning Z	5 $\mu\text{m}$
Lateral Resolution	0.13 nm
Vertical Resolution	0.05 nm
Scanning Schema	Movable Sample Under Stationary Probe
Scanner Type	Piezo ceramic
Maximum Sample Size	20 mm
XY Micro Positioning stage	2.5 $\mu\text{m}$
Embedded Video System	Visualization on a PC connector via USB port from top and side
Scanner DAC/ADC Resolution	16 bit



## Scanning Tunneling Microscope (STM)

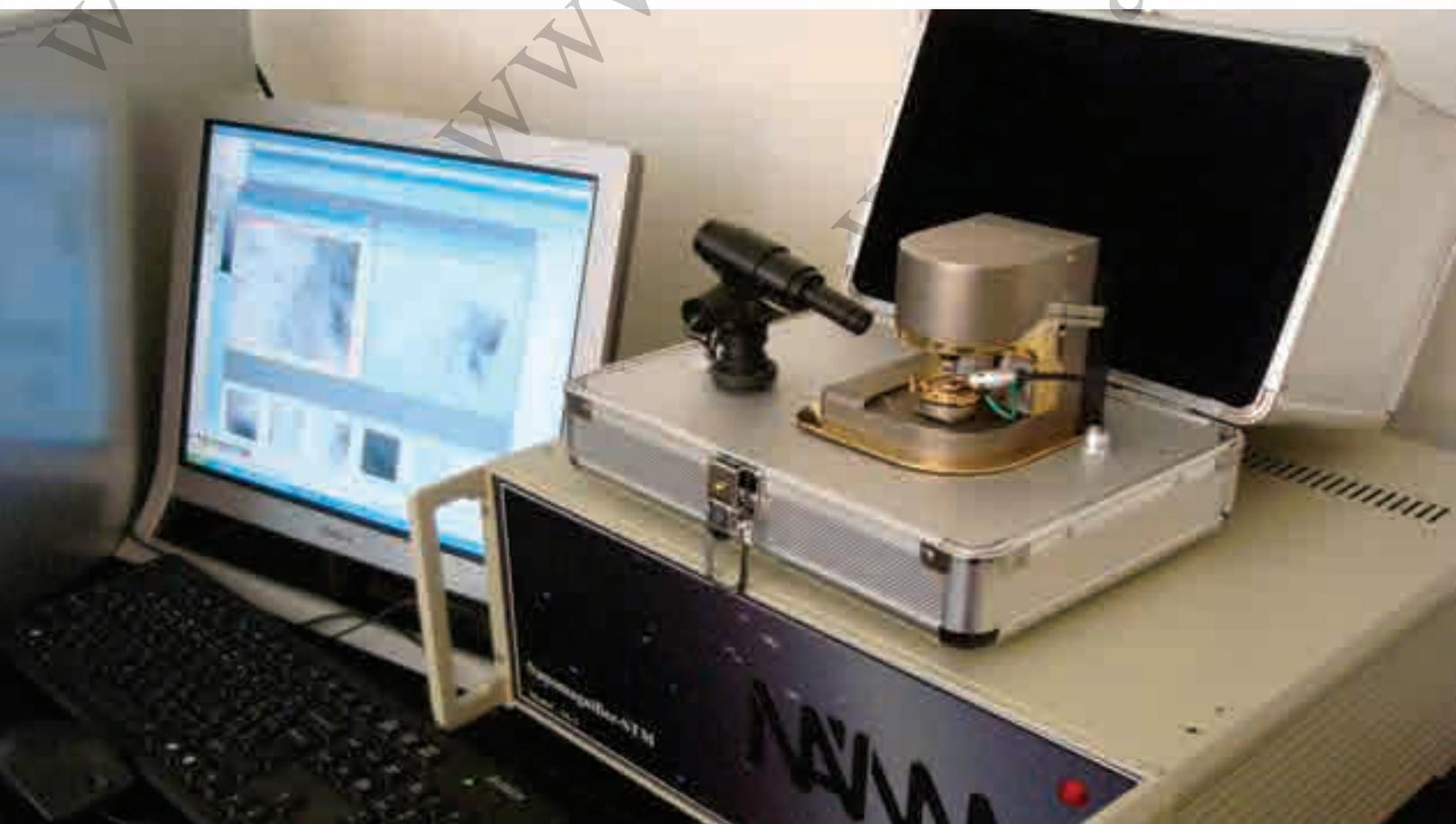
A scanning tunneling microscope is a powerful tool for obtaining micrographs from conductive and semi conductive materials. The imaging technique has recently been improved for microscopy of nanostructured biomaterials on highly ordered atomic surfaces.

### Features:

- Automatic mechanism to approach sample
- Automatic sample and camera moving by software
- Engraving of nanometer-scale surface by lithography
- Ability of tilting (adjusting X, Y axis in sample)
- Ability to view online height and current during scanning
- Ability to change the parameters of the PID, current and voltage during imaging
- Provide 2D and 3D images at nanometer-scale simultaneously
- Ability to measure the size of material on the image
- Hardware zoom capability for desired more detailed image
- Software zoom capability for desired area
- Ability to customize the color of image file specification
- Ability to measure the size of material on the image.
- Hardware zoom capability for desired more detailed image
- Software zoom capability for desired area
- Ability to customize the color of image file specification

### Performance

- Expandable to suite user needs
- Designed for quick and reliable measurements by experts and novices alike
- Unique price/performance ratio for research and teaching
- Mechanical Stability
- Thermal drift balance
- Low Electronic noise
- Ergonomic Design
- Windows-Based Powerful Software
- Easy Maintenance



### Features:

- Capability to change size, angle and location of image by software without handling the sample and ability of automatic offset calculation
- Imaging capability in both constant height and constant current modes with minimum electronic noise
- Ability to display multiple clear and accurate 2D and 3D image files in order to compare them

STM Software	
Various charts of the scan data can be displayed simultaneously	3D view Image, Line graph, color map
Various charts of the spectroscopy (I-V, I-Z) data offline	Line Graph, first and second derivative , ...
Noise Reduction and Feature Enhancement	Data filtering in three levels
Lithography Pattern	16 Color BMP and .dxf files
View all maximum scan range and change parameter	
Data Export	TXT,BMP,JPEG,GIF, ...
Automatic image transfer to offline processing software Analyzer	

Electronics	
Electronics Size	55×55×18 cm
Power Supply	220 V~/ 50 Hz/ 1A
Computer Interface	16 bit Data Acquisition Hardware
Scan Speed	Up to 100 Line/s at 128 data point / line
Scan Image Rotation	0 - 360°
Sample Tilt	Automatically by software
Spectroscopy Modes	Single point measurement
Spectroscopy Data Point	Up to 2000

STM MEASUREMENT	
Maximum Scan Range	8-16 $\mu$ m
Maximum Z-Range	3 $\mu$ m
Drive Resolution Z	0.045 nm
Drive Resolution X, Y	0.12 nm
Current Set Point	0.02 -100 nA in 3 pA steps
Imaging Modes	Constant current(Topography), Constant Height (Current)
Spectroscopy Modes	Current-Voltage, Current-Distance
Lithography Modes	Bitmap, Vector and Manual
Tip Voltage	$\pm$ 10 V in 0.3 mV steps
Sample Approach	Fully automatic and manual control
Sample Size	Max 20 mm diameter