





## Center of Innovation for Green and High Technologies (CIGHTECH)

### *An International Effort to Transfer New Ideas to Real Products*

#### **Overview:**

Cightech is a private innovation center that is designed to open up new opportunities by generating novel high-tech ideas, to be a hub for its associate partners (academic and/or industrial who are professional in multidisciplinary fields), and to contribute in the project management. We actually, create new high-tech ideas that can be achieved in accordance with our associate partners and generate new project proposals for funding from government and/or industry. After allocating the budget we systematically manage the process in association with other professional partners to achieve promising outcomes that may be prototypes, research reports, scientific papers, and .... Cightech will be an independent partner in any project with budget defined in any proposal and may not charge academic associate members depending to the case.

[www.cightech.ir](http://www.cightech.ir)

#### **Cightech Instrument:**

Based on the researchers' demand discovered by Cightech team, we plan to promote research facilities internationally. Our products are actually selected carefully from high quality and inexpensive research facilities, produced by different companies. The selected items also are improved technically or aesthetically by Cightech team, to meet the quality of international promotion. Our producers are mostly academic researchers who know the exact need of high-tech research and can give **professional consultancy and technical services/trainings** based on their knowledge as well. The quality and price of our products are amazing (**many of them cost almost half the price of similar quality**) such that we had a successful record of selling to high level universities. In addition, most of our products can be **customized** for different users that is **excellent option** for our customers. If you have research challenge please contact our professional team. We will be happy to help you.



## ***List of our research facilities:***

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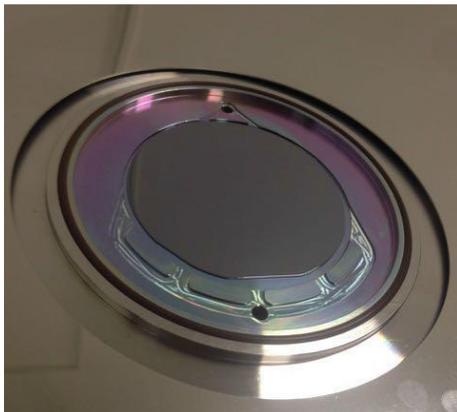


# **Thin Film and Surface Science**

## **(Fabrication and Processing)**

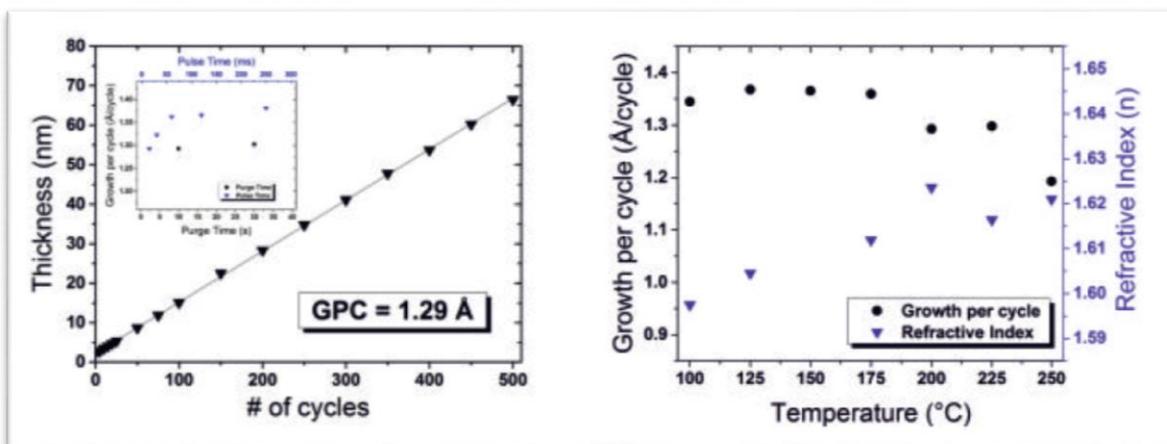
## Atomic Layer Deposition (ALD)

Atomic Layer Deposition is a unique yet simple thin film coating technology enabling sub monolayer thickness precision, ultimate conformality and excellent large area uniformity. A team of ALD researchers have developed and tested this valuable, high quality, inexpensive ALD system and service. The concept used in the design of this system is new, for example the patent pending reactor design enables the user to increase uniformity of thin films. This system provides unprecedented coating performance and film quality ranging from oxides, nitrides, metals and sulfides. Our ALD system also facilitates cutting-edge research on exotic materials and processing including two dimensional materials, selective ALD, materials synthesis, and surface treatment. With this system you can have up to 8 inch substrate, multiple precursor lines, max 300 C process in-situ metrology, ALD coating services, ALD precursors short delivery times. Our system is flexible, the **services are reliable** and **quality and price are amazing** such that any ALD researcher should have one in his/her lab. **Our ALD professionals also can give full services including consultancy and deposition of organic and inorganic films with amazing quality and price.**

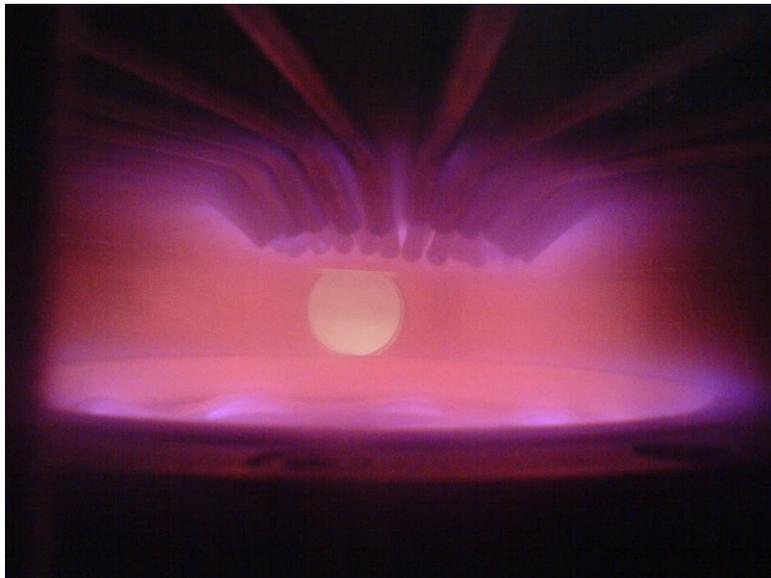


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## ***Plasma Enhanced Chemical Vapor Deposition (PECVD)***



PECVD is a processing that placed considerable thin layer of any kind of material on substrate at low temperature. Required temperature is decreased as plasma reduce activation energy. One electrode is grounded and the other one is connected to RF generator. Plasma is formed between these two parallel electrodes. As result of capacitive coupling, input gas will becomes to plasma, chemical species is produced and thin film is decomposed on substrate. Substrate temperature can varied between room temperature and 350°C. System's temperature is depend on the kind of decomposition. The description will be added later.

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This product can control the layer stress by low/high frequency combination technique, has lower working temperature compare to conventional CVD systems, and using plasma cleaning of the chamber without any need to use toxic or wet chemicals. This PECVD system controls the stoichiometry of the process which gives the user the capacity to deposit of a wide range of materials including  $\text{SiO}_x$ ,  $\text{SiNx}$ ,  $\text{SiO}_x\text{N}_y$  (applied to photonic structures, passivation, hard coatings ...), a-Si:H, TEOS and  $\text{SiO}_2$ , SiC, DLS deposition and several other materials suitable for variety of applications.



## ***Ultrasonic Spray Deposition***



This ultrasonic spray system is capable of atomizing liquids with extremely fine droplets for applications which require extremely high level of control. Liquid is injected into the ultrasonic gun with a rate of 0.02 - 50 ml/min atomized at the gun head, and conveyed to the substrate surface by a gas flow. Spray gun is fabricated from corrosion-resistant titanium providing long life and excellent acoustical properties. The gun can be placed on an **optional x-y stage** in order to make uniform film deposition. The user is capable to fabricate uniform spray films by ultrasonically atomized liquids using features like syringe pump, spray gun, and ultrasonic generator.

## ***Spray pyrolysis system***

This spray pyrolysis system has been designed for spray deposition of thin films in research laboratories, especially for solar cells fabrication. The hot plate consists of illumination heating of a special low-E glass; facilitating easy plate cleaning and perfect substrate/hot plate thermal contact. The glass spray nuzzle offers enhanced chemical spray compatibility for spraying different solutions, while being easy to clean. Each system includes two spray guns.



## ***Plasma surface cleaner***



For certain applications related to thin film technology, it may be necessary to achieve absolutely clean, and oxide-free surfaces. As a solution, plasma cleaning is an important process in surface technology such that the purity levels thus achieved are extremely high. The system we are offering is calibrated

for 30 different kinds of gases such as oxygen, hydrogen, and air process gas or optionally any kind of process gas with volume chamber of 3L (optional: 5L, 30L, 130L) and is suitable for plasma cleaning of plastic as well as glass and ceramics. This system is also automated by touchscreen, digital power meter, and digital controller.

## ***UV-Ozone surface cleaner***

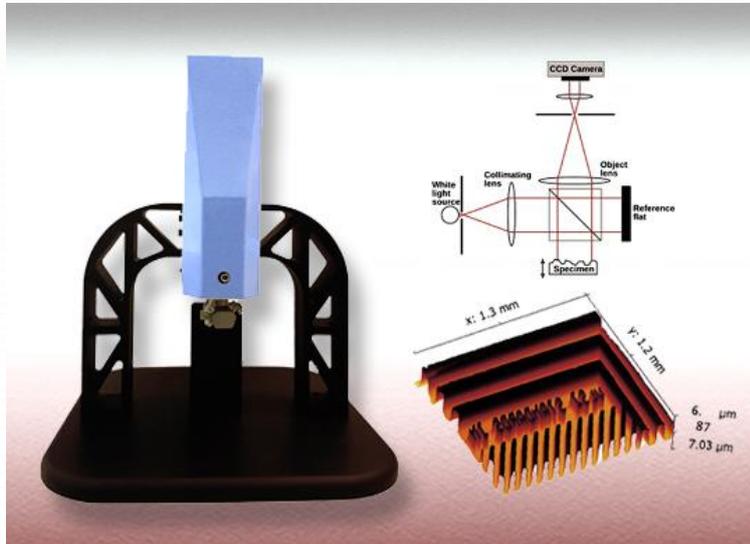
It is often critically important to clean the substrates to a molecular level before device fabrication. Conventional cleaning techniques often leave a monolayer of organics on the surface, which is detrimental in device performance. The ultraviolet (UV)/ozone cleaning is a simple-to-use, inexpensive, fast and dry method that rapidly removes organic contaminants including oils and greases, fluxes, skin oils, and contamination adsorbed during prolonged exposure to air. Contact angle measurements and wettability tests confirm the performance of this method. In this method samples are exposed to a certain dose of simultaneous UV/ozone, at optimum and controlled conditions. The exposure time is set by a timer and oxygen can be injected for improved performance.





# **Thin Film and Surface Science (Characterization)**

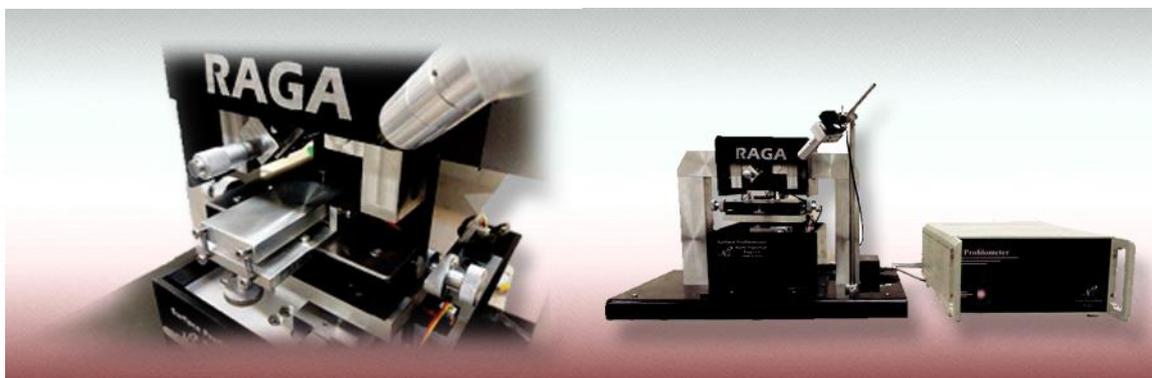
## ***Optical nano surface profilometer***



This system uses white light interferometry technology to obtain topographic image from surfaces. The data recorded using a high speed/accuracy 3D moving stage is analyzed by standard software such as “Gwyddion”. This system can offer an **accuracy of 5nm** with a scan window size of **1mm×1.2mm** and **10mm height** displacement as well as **high speed scan rate** and is suitable for **soft and hard samples** in

various size and shapes. The stage is also can be **customize** to a mosaic like extra-large window size (**centimeter scale**) based on customer request.

## ***Liner nano surface profilometer***



This profilometer works in contact mode. It measures the surface roughness, curvature and step as the sample is moved relative to the contact profilometer’s stylus. As the stylus moves up and down, laser spot move up and down too. A light detector measure laser spot displacement.

The minimum step that profilometer can measure is 50 nm and it’s precision is about  $\pm 10$  nm. The maximum height that it can measure is 100um. Scan line size is 3mm and it can be customized to 10mm or more. profilometer has it’s own software to draw sample roughness and height vs tip position. The whole process is controlled by computer. Our Profilometer Can Measure Fast and Easy and Cheap.

## ***Optical micro surface profilometer***



This system uses triangle laser technology and a combination of optical system, CCD camera, and automatic moving sample/sensor stage to scan surface of the specimens and gives a 3D image of the surface in micrometer level.

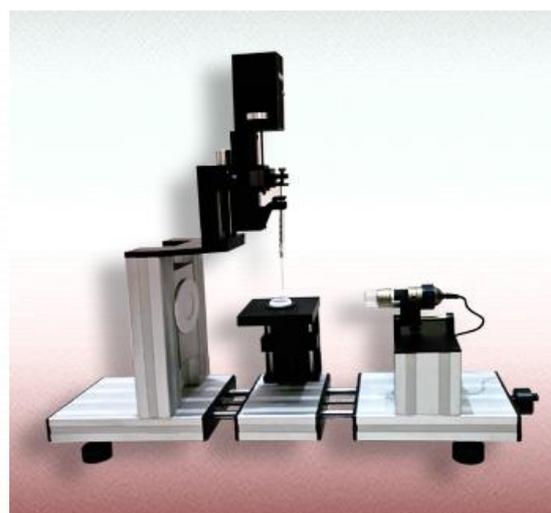
Noncontact and repeatable measurement, precise (1 micron) and high speed data recording, large and customizable sample testing (maximum window size for samples of about 20×20 cm<sup>2</sup>), and ability to analyze resulting 3D topographic images of surfaces with

gwyddion software are characteristics of this instrument that make it suitable for roughness, thickness, and corrosion measurement in micrometer size.

## ***Contact Angle measurement system***

Contact angle measurement is a critical analysis to evaluate the wettability and surface energy of substrates and films. This system is a manual system, which allows putting precise volume of a liquid drop on the surface and measurement of contact angle using software. We offer a manual and affordable system to measure the droplet contact angle with best price.

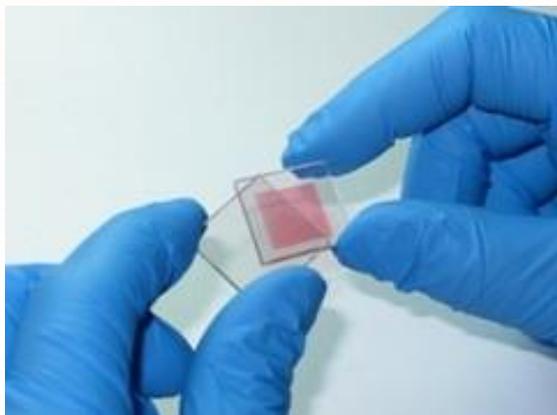
This instrument uses Sessile drop measuring method, manual curve fit analysis, ±1 degree inaccuracy for 0-180 degree measuring range, LED based diffused lighting mechanism with variable Light intensity, high performance CMOS Sensor video system (1280 x 960 Pixel., 90x magnification), and mechanical dispenser with precise microliter control (A 100 microliter syringes is provided with the system.).





# Solar Cell Series

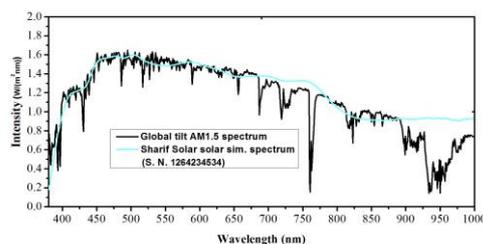
## Solar cell training/fabrication/analysis service



Our professional team of solar cell who are university professors and experienced researchers can give training/fabrication/analysis service for any research team who are interested to initialize a research line about solar cell or need to support more their lab with best quality and price. As an example, we can provide professional training about “**Perovskite Solar Cell**” and support them with materials such as “**Perovskite Paste**”, and solar cell fabrication as well as impedance and/or Fermi level measurement.

## Solar simulator

Solar Simulator is a light source that creates precise simulation of sunlight for scientific research and testing. This simulator is used for the standard testing of solar cells at Air Mass 1.5 Global (AM 1.5). It is based on mixed light of LEDs and filtered halogen lamps and simulates the sunlight spectrum from 380-1000 *nm*. Total difference of the solar simulator output with sunlight spectrum is **less than 5%**. Filtered halogen lamps provide visible and near-IR light and white and single wavelength LEDs cover the visible region. LEDs and lamps can be turned-on independently, making it possible to test the devices at specific wavelengths and also Voc decay experiments. For AM1.5 measurements, the sample-lamp distance is adjusted by a **calibrated photodiode** and a **mechanical jack** to change the distance. The accuracy of produced spectrum can be evaluated by measuring the light intensity of LEDs and lamps using photodiode.



## ***IPCE measurement system***



External quantum efficiency measurement system (IPCE or EQE) is an essential tool to study optical performance of solar cells and is a complementary analysis for the basic I-V characterization, which provides the power efficiency of the device. The system we offer provides quasi monochromatic light using single wavelength LEDs in the wavelength range of 370-940

nm. Measurement is controlled by software and calibration is made using an internal reference cell. An important advantage of this system is the **high intensity of incident light** compared to monochromator-based systems. This leads to device IPCE measurement at  $V_{oc}$  near to the operating condition; which is especially important for thin film solar cells. This system can be used for silicon solar cells, DSSC, Perovskite solar cells, CIGS solar cells and organics solar cells.

## ***Hall effect measurement system***

The importance of the Hall measurement is supported by the need to determine accurately carrier density, electrical resistivity and the mobility of carriers in semiconductors for thin film solar cells, LEDs and TCO layers. The system we offer is an AC system, providing alternating (AC) magnetic field (Max. field intensity of 1 T (peak to peak)) and a unique technology for noise reduction (Min. measurable Hall voltage 10 nV), for characterization of high resistance



layered semiconductors (Max. surface resistance of sample 10 G $\Omega$ ), e.g. CIGS, and organic materials. If you wish to use an accurate Hall effect measurement of high resistivity films by AC magnetic field, we suggest to try our hall effect system.



# Laser and Spectroscopy

## ***Green laser sources***



This solid state lasers use Nd:YAG and ND:YVO4 rods for creating 1064nm beams. The pumping sources in these lasers are high power diodes that pump the rod in transversal direction. The 1064nm wavelength is converted to 532nm by KTP crystal. The maximum output power of

these lasers is variable from 200mW up to 100W. These laser sources have research, medical and industrial applications such as laser spectroscopy, material processing, holography, interferometry, educational and experimental issues, general surgeries, marking, cutting fine sheets and micromachining.

## ***Pulsed lasers, 700mJ series***

Ce:Nd:YAG pulsed sources are lamp pumped solid state lasers that use a resonator and an amplifier to create laser pulses. These series are Q-switched by electro optic modules and create polarized pulses with a few nanosecond temporal width, frequency of 10Hz and energy of 700mJ. The outputs of these laser are high quality beams. These laser series are presented with various harmonics.

Nowadays, short pulse lasers have wide applications in industry and advanced research. Short pulse lasers are used in advanced spectroscopy techniques, Lidar, radar laser sources, distance meters, ultra short laser pumping, holography and interferometry.



## Fiber Coupled Diode Laser Series

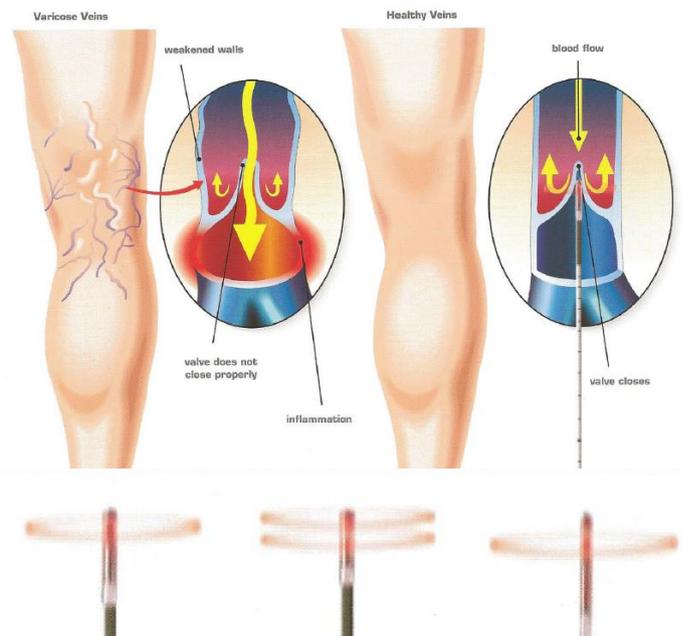


FCP diode laser series are coupled to 19 fold bundle of optical fibers by direct coupling method. The output laser beam is continuous and it emerges from a fiber array with 200 or 400 micron diameter and numerical aperture of 0.22. The cooling system is consisting of TEC and appropriate fan. In addition, this product creates a stable output power by means of a current power supply.

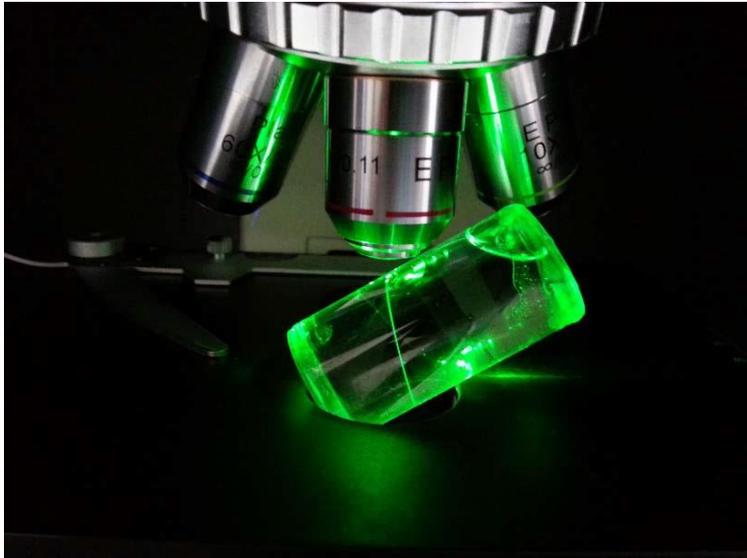
This laser source can be used for pumping of solid state lasers, spectroscopy and research applications.

## Surgical laser ablation fiber (Varicose Veins)

Endovenous laser ablation technique, is a common treatment method in order to close varicose veins by high power laser beams. In this method, laser beams are delivered using fiber optical laser probes. Laser probes with **radial emission** have better characteristics in terms of light delivery to target area without injuring the adjacent tissues, compared to bare-ended fibers with forward emission. Our suggested surgical laser probes, emit light as a single ring or two rings with homogenous intensities, depending on the application requirements. With probes produced with highest quality standards, problems such as power loss or carbonization are avoided, enabling efficient laser operation with lower laser powers. We offer three types of the highest quality (**EN ISO 9001, EN ISO 13485, and CE**) with amazing price (**almost half price of same quality in market**) fibers operating with lasers with 400-2200 nm wavelength.



## ***Raman microscope/microscope***



This Raman microscope include an optical microscope to see samples (with eye or capture by a camera attached to the system) combined with a Raman spectroscopy system which works with a Nd:YAG (cw) green laser (532 nm, 100 mW) and packaged in a nice, handy, beautiful, and safe design. This system offers interesting details and resolution in measurements with an improved detection and sensitivity. Spatial reso-

lution on samples of about 12  $\mu\text{m}$  and spectral resolution of 10  $\text{cm}^{-1}$  in the spectral range of 150-4600  $\text{cm}^{-1}$  can be obtained by this system. The measured data then is analyzed by a version of Tunsu software which offers a wide range of control on the recorded spectrum.

This Raman microscope is designed for characterization and identification of small particles as well as organic and inorganic samples in the form of tablets, powders in plastic packages, and liquids in clear and brown bottles ... which make it suitable for applications in nanotechnology, polymer sciences, geological and pharmaceutical applications, and several other application.



# **CIGHTECH**

No. 303, Sepanta Building (No. 21),  
Ajoodanieh St., Ajoodanieh St., Tehran, Iran

[www.cightech.ir](http://www.cightech.ir)

[info@cightech.ir](mailto:info@cightech.ir); [cightech@gmail.com](mailto:cightech@gmail.com)

+989120434022; +447466135120