



Nano Fiber Double Spinning & Yarning System

Model : HO-NFES-SYS

Nano Fiber Double Spinning & Yarning System is known as one of the most efficient, convenient methods to produce fibers of a nanometric scale. These nanometric fibers reveal several remarkable characteristics such as a large surface area to the volume ratio, high porosity, flexibility in surface functionality, and superior mechanical performance. Nanofibers are utilized in a wide variety of applications such as filtration and multifunctional membranes, medical usages, and military systems due to their outstanding properties.

Holmarc's Nano Fiber Double Spinning & Yarning System comprises of a bipolar high voltage supply and a set of collectors for different applications. The instrument also equips with a unique rotary collector through which user will be able to spin the fiber into threads and collect it in spools. The diameter of the fiber depends on various parameters but mainly flow rate. In order to make fiber in to yarn, two syringe pumps, one with positively charged spinneret and the other with negatively charged spinneret, are targeted to a funnel shaped collector from where fiber yarns are formed and rolled into spool.

The equipment is controlled by a software compatible with Windows OS. The parameters like solution flow rate, rotating speed of the funnel or mandrel collector, duration of electrospinning, horizontal and vertical speeds of the spool etc can be controller using this software.

KEY FEATURES

- ▶ Cabin Heating : Up to 45°C using 1000 watt coil heater
- ▶ The chamber is provided with Residual Charge Discharge Stick which is used for static charge removal.
- ▶ Safety switch provided to switch off H.V. Power supply when door is opened.
- ▶ LED cabin lighting and back light to view Needle tip and electro spin process.
- ▶ Exhaust fan is provided for solvent vaporization. It is also used for cooling down the equipment after spin process.
- ▶ Emergency stop is provided on the control panel to stop the equipment where there is any emergency.
- ▶ Graduation scale provided on the granite surface in X & Y direction which helps the end-user to achieve repetitive results by marketing the positions of syringe pumps, target and yarn spool.
- ▶ User friendly software enables PC interfacing that helps the regulation and control of various features like Rotating speed of the funnel or mandrel collector, Spin Duration, horizontal and vertical speeds of the spool, Syringe pump flow rate, etc.
- ▶ Rotating Mandrel targets of varying diameters, Stationary target, Reciprocating XY target, metal funnel collector and yarn spool provided with the system.
- ▶ Coaxial spinneret : Our Nano fiber electrospinning unit is equipped with Coaxial spinneret which helps to produce Hollow nanofibers and Core / Sheath nanofibers. This technology can also be used to combine different characteristics of each polymer into one fiber.
- ▶ System hood has features like Exhaust fan, halogen lighting and transparent door for monitoring electrospinning process.
- ▶ Built-in Arc Protection Circuit

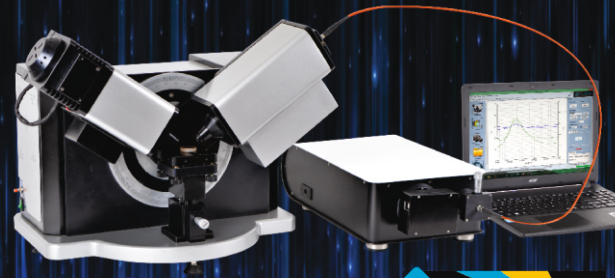


SCAN & WATCH



Variable Angle Spectroscopic Ellipsometer

Model : HO-SE-01



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SPECIFICATION

I Bipolar High Voltage Switched Mode Power Supply

HOLMARC'S HO-NFES-SYS comes with HMPSKV30 model high voltage power supply. It has -15kV to +15kV output voltage range with maximum current capacity of 0.5mA. Output voltage and current can be set using front panel knobs and read out from the digital panel meters.



Specifications :

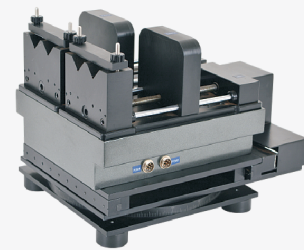
- ▶ -15kV to +15kV Output Voltage, 0.5mA max current
- ▶ Digital voltmeter and current meter
- ▶ Static charge removal device - shorting stick
- ▶ Constant current / constant voltage mode of operation
- ▶ Built-in short circuit protection

II Independently Controlled Dual Channel Syringe Pump

HOLMARC'S HO-SPLF4 model syringe pump provides independent control of two dual channel syringe pumps. The speed and flow rate can be changed on both to achieve custom fabrications of fibers.

The Syringe pump also can be moved to and fro in X axis. The maximum travel is 200mm. The movement is controlled via PC.

- ▶ To dispense from standard disposable or glass syringes from 5 to 20ml
- ▶ Syringe holder made of insulating material to work under high voltage conditions
- ▶ Motor control through microcontroller to control and indicate flow rate
- ▶ Four syringe dispensing system
- ▶ PC based control with documentation of parameters like syringe diameter, flow rate, spray duration etc.
- ▶ Manual height adjustment platform to vary the pump height according to the target height.



III Metal Funnel Collector

Metal funnel collector is a funnel shaped rotating mandrel where fiber yarns are formed and rolled into spool. A thin film web of nanofiber is first formed on a metal funnel collector and is drawn initially to a 3D cone shape. With the rotation of funnel collector, a twisted nanofiber yarn is drawn from the vertex of the cone.

- ▶ Rotating speed : 300 to 4000 rpm
- ▶ Material : Aluminium
- ▶ Diameter : 100mm

IV Yarn Spool

Yarn Spool is compact and modular motorized positioner for rolling the nanofiber yarn into spool. Stepper motor is used as electrical actuator. Yarn spool is XY axis configurable.

- ▶ Material : Acetal resin
- ▶ Rotating speed : 1 to 100 rpm
- ▶ Linear reciprocating movement : 50 mm



V Rotating Mandrel



Rotating mandrels which comes with the electrospinning unit can be used as a target to get an aligned continuous mesh of nanofiber. It has a speed range of 300rpm to 4000rpm suitable for electrospinning. Grounding of the mandrel to the HV power supply is attained through a carbon brush contact. The rotating mandrel has a speed stability of +/- 1%. Holmarc's HO-RM-01 is a high speed rotating mandrel assembly which works with Holmarc HO-MN series mandrels of 2mm to 100mm diameter and is of 200mm length. No. of mandrels supplied are 100mm, 75mm, 50mm, 25mm, 15mm, 12mm, 6mm, 4mm, 2mm.

- ▶ Stainless steel drums of different sizes
- ▶ Rotational Speed : 300 - 4000 rpm
- ▶ Grounding facility : Available
- ▶ Actuator : Microprocessor controlled BLDCmotor
- ▶ Speed stability : +/- 1%
- ▶ PC based control with documentation of speed and duration

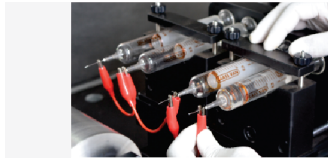
VI Y Plate Collector & Stationary Target

This collector can be used as Stationary target or as Y plate collector. The stationary target which acts as a collector of electro spun nanofibers, is made of stainless steel and it can be held vertically on a tabletop. It also has connector for grounding.

- ▶ Plate Dimension 250 x 175 x 3mm
- ▶ Plate Material : Stainless Steel
- ▶ Grounding Facility : Available
- ▶ Programmable Y motion profile to control the nano fiber deposition characteristics
- ▶ PC based motion control with documentation of parameters like speed, traverse, motion profile and duration



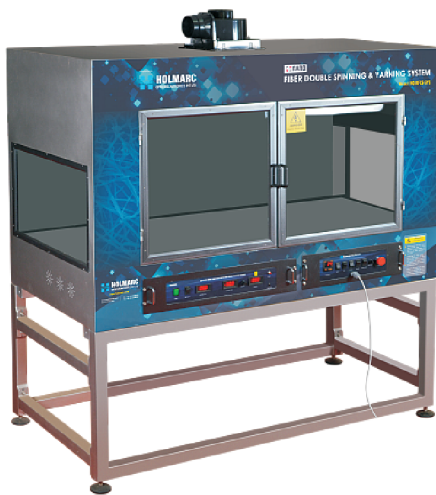
Using a stationary target alone cannot attain a uniform density of fibers, as most of the fiber is collected around the point orthogonal to the syringe needle. Combined with X movement provided on the syringe pump, the Y translation stage on the target keeps the target moving according to a commanded motion profile. Depending on the motion profile, fibers get collected uniformly on the target. The motion profile can be created using a series of commands available in the software.



VII Spinneret

a. Needle spinneret : The Flat tipped metal needles are provided for the easy flow of nano fibers. The high voltage is connected to the tip of the needle using metal clips.

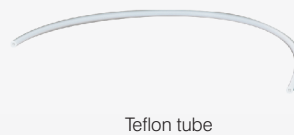
VIII Fume Hood



HOLMARC's HO-FH-06 model fume hood provides an enclosed atmosphere for electrospinning. An enclosed chamber is necessary to protect the user from pollutant air caused by solvent evaporation during the process. It comes with an exhaust fan attached or optionally with a duct of custom dimension so that it can be connected to an exhaust duct available onsite.

HOLMARC's Fume Hood also has an option for in-built heater capable to provide a temperature up to 45°C. An independent PID controller ensures precise control of temperature. A common electronic control unit for all the devices in the electrospinning system is integrated within the hood. The fume Hood has transparent side walls and front shield made of float glass. This ensures good visibility of the process. High intensity light from the optional halogen lamp illuminates the nanofibers being spun on its way to the target. The table top is made of granite which makes the cleaning process easy.

- ▶ Standalone unit with in-built power supply and wiring for the heater, lighting and exhaust
- ▶ Transparent glass windows on three sides for easily monitoring the electrospinning process
- ▶ Foot print: 1700mm x 800mm x 1950 mm
- ▶ Construction Material: Stainless Steel, Aluminium & Glass
- ▶ Epoxy coated for electrical insulation
- ▶ Ambient to 40°C temperature control
- ▶ Exhaust fan ventilation at the top of the hood which can be connected to an exhaust inlet available at the customer facility.



IX Accessories

- ▶ Normal glass syringe
- ▶ Spare needle
- ▶ Teflon tube

X UV Curing Lamp (Optional)

A special 10W 254nm UV light can be added on top of the rotating collector drum which helps to cure the spun fibers.

It can be switched on during the operation or when fiber spun is completed on the collector drum.

As the UV light is harmful for our skin and eye, the glass surfaces of the chamber is protected with special coatings to reflect maximum UV.

The controller is also provided with an ON / OFF Switch for the UV Lamp.

