

noanix[®]

Noanix Corporation connects
the world with Creative Custom





Noanix Corporation manufactures and provides coating and machines for medical devices. Main medical coatings are drug-eluting coating, hydrophilic coating, hydrophobic coating, antimicrobial coating and antithrombogenic coating.

Devices are coating machines, spray nozzles, pumps and friction testers.

Noanix enjoys building custom designed products for your harsh and unique applications.

The company is ISO9001/13485/14001/45001 certified.

Applications

- ☐ Stent
- ☐ Balloon
- ☐ Catheter
- ☐ Guide wire
- ☐ Artificial blood vessel
- ☐ Syringe/Blood collecting tubing
- ☐ Needle
- ☐ Contact lens
- ☐ IOL cartridge
- ☐ MEMS
- ☐ Biochip
- ☐ Medical textile
- ☐ Insertion sleeve
- ☐ Medical tube

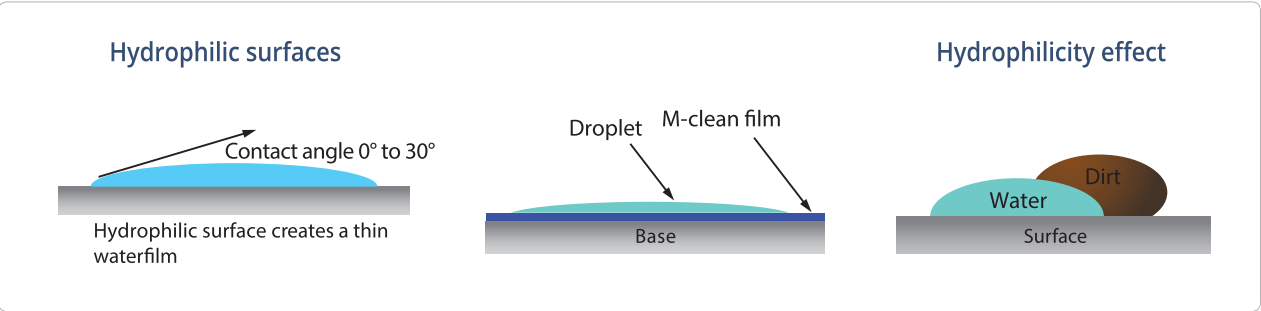
Materials(Noacoat®)

○ Hydrophilic Coating

- * Introduction**
- Hydrophilic coating for medical devices is lubricious, abrasion resistant, Non-thrombogenic and biocompatible. Suitable for coating vascular catheters, guide wires and other medical devices, they can be applied to a wide range of polymeric and metallic substrates.
- * Advantages**
- Exceptionally hydrophilic
 - Biocompatible
 - Very thin, flexible coatings can be applied
 - Lubricious when wet, preventing trauma and tissue abrasion
 - Prevents adhesion of platelets, proteins, and microorganisms



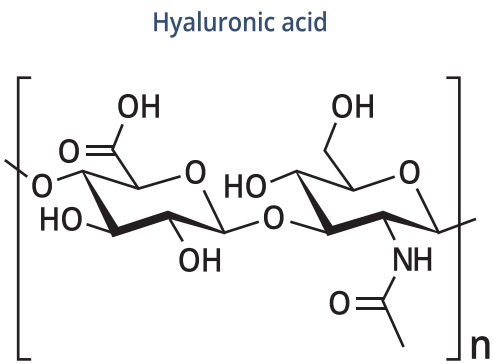
- * Properties**
- Physical properties are readily adapted to meet the design criteria of medical device applications
- Thickness
 - Storage stability
 - Lubricity / flexibility
 - Wettability
 - Abrasion resistance



● HA Coating

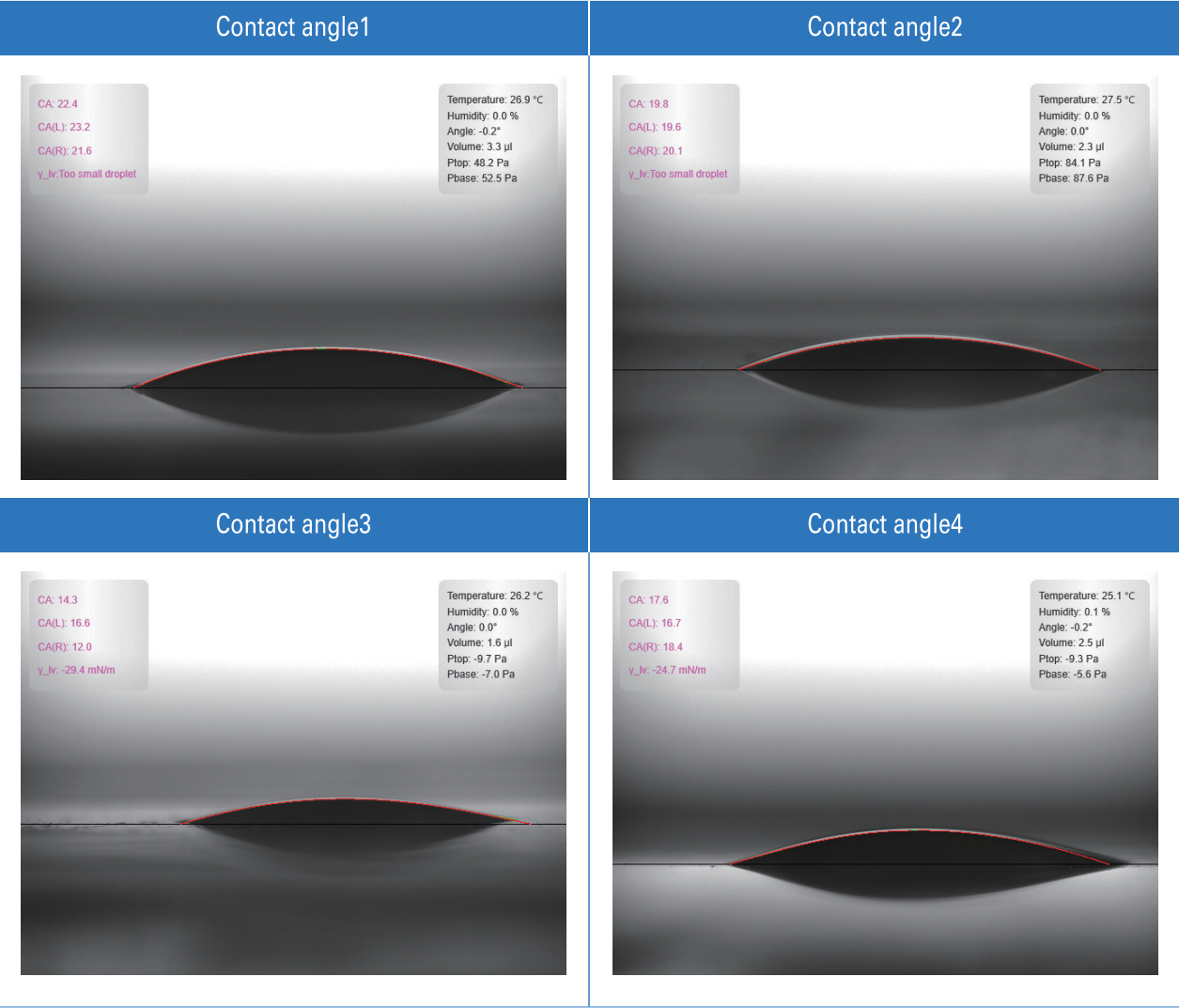
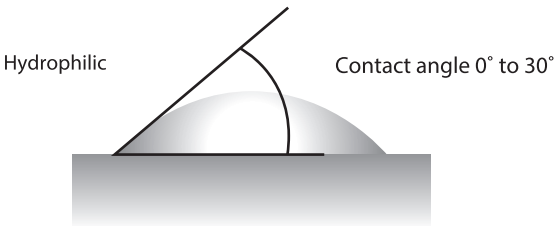
* Introduction

- Noanix's main hydrophilic coating solution uses hyaluronic acid, which is an FDA-approved natural polymer with excellent biocompatibility and low rejection reaction, so it is used in various fields of our body, such as ophthalmic supplements, intra-articular injections, artificial tears, and wound healing.
- HA is a kind of mucopolysaccharide, has a water content of 6000 times, is a method of attracting moisture in the air, and is stable as EWG 0 grade. In addition, it has high lubricity and durability, and was developed to be applied to various medical devices.



* Advantages

- Super Lubricious
- Really biocompatible
- Extremely durable



* Substrates to be coated

- Pebax

- PEEK

- PP

- PE

- PC
- TPU

- PMMA

- Teflon

- Silicone

- Metals – Ni, SUS

- Primer

- Covalently bonded with HA Top Coating

- Generally no pretreatment required

- Custom tuning possible

- Several base coats versions available

* Noanix Bilaminar Coating’s Advantages

- Biocompatible(Natural polymer, HA)

- Extremely durable and lubricious

- Various coating solutions(HA main, PVP and PU optional)

- FDA approved ingredients

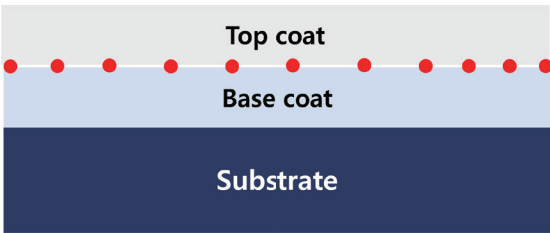
- Very low particles

- Various basecoats and topcoats versions

- Safe, eco-friendly and non-flammable solvents used

- Batch process for mass production

- Viscosity controllable



* Bilaminar system

	OB bilaminar system	DP bilaminar system
TPU	Not recommended	Excellent
PEBAX(hard)	Excellent	Excellent
PEBAX(moderate)	Excellent	*Good
PEBAX(soft)	Excellent	*Good
PP	I System recommended	
PC	Not recommended	Excellent
Silicone	Triple coating recommended	
PE	Excellent	*Excellent
PTFE	Excellent	*Good
ETFE	Excellent	*Excellent
SS	Excellent	*Moderate
Nitinol	*Excellent	*Moderate
PMMA	Not recommended	Excellent
PVC	New System recommended	
PEEK	Not recommended	Excellent

*: Pretreatment required

| PRODUCT |

● PVP Coating

* Introduction

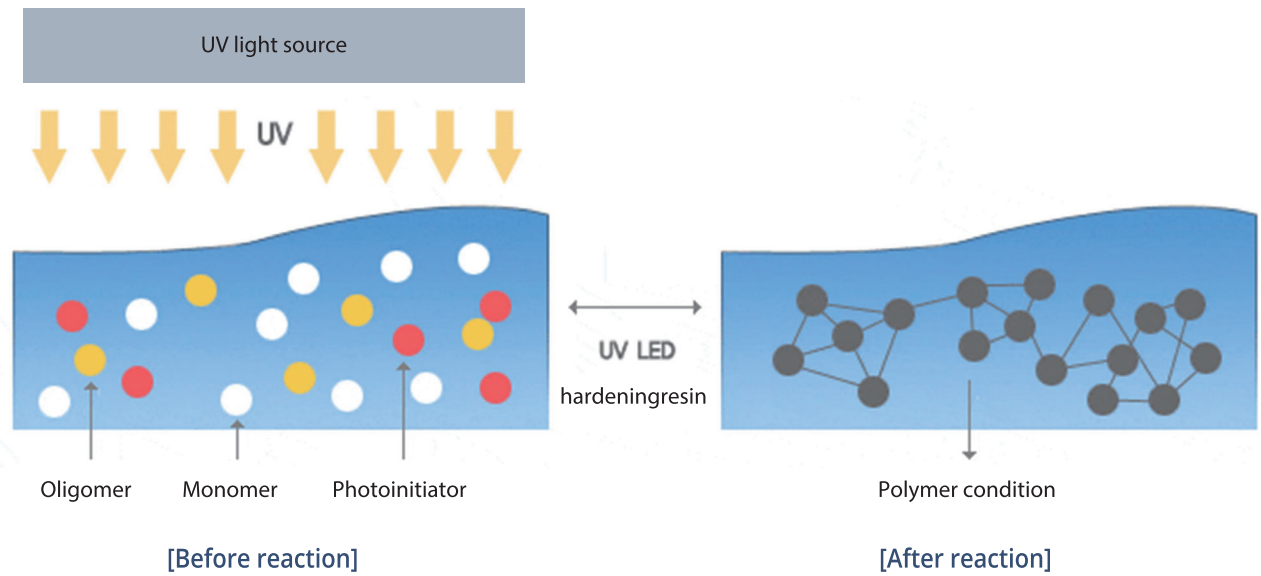
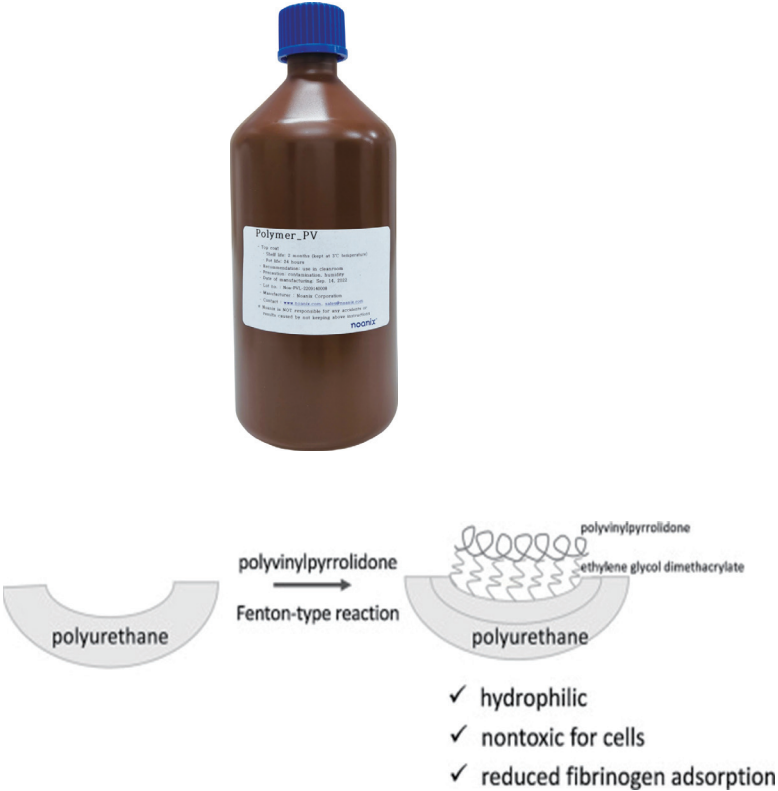
- Single(or double) coating, UV curable
- Heat cure version available
- A primer can be combined

* Advantages

- Eco-friendly
- Longer shelf and pot life
- Flexible
- Short curing time

* Suitable Substrates

- TPU
- PEBAX
- Silicone
- PE
- PMMA
- PVC
- PEEK



| PRODUCT |

● Antithrombogenic Coating

* Introduction

- Antithrombogenic coating does not have to control the amount of thrombosis that should be classified patient
- Not injecting into the body does not cause problems such as cerebral hemorrhage.
- It is widely used in bioimplantable devices such as implants.

* Advantages

- Safety
- Ease of use
- Reduce the risk of drug injection
- Antithrombogenic

* Visual inspection of ECMO tubes coated with antithrombogenic coating

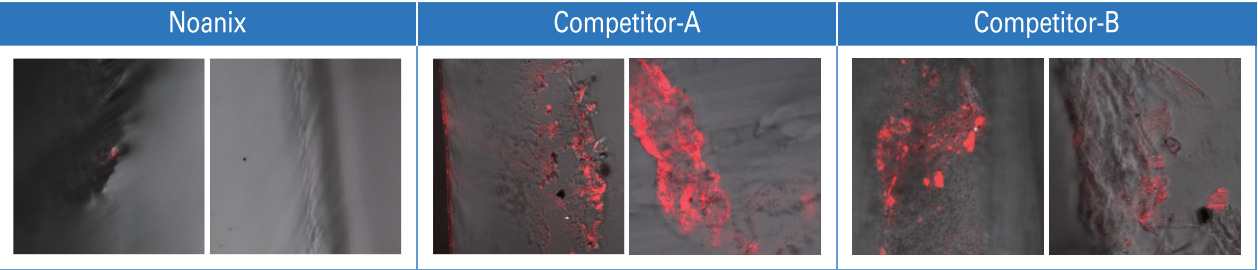
- Visual inspection of tube after in vitro circulation for 48hr.

Sample name	Tube	Connector	Cone head
Noanix			
Competitor -A			
Competitor -B			

Sample name	Pump hour	LPM start	LPM end	Presence of thrombosis in priming solution	Intra-tube surface agglomeration	Thrombosis in the connector	Thrombosis in the cone head
Noanix	48	7.2	7.2	1+	-	-	±
Competitor-A	48	6.0	5.5	-	3+	2+	3+
Competitor-B	45	6.0	4.4	-	3+	2+	4+

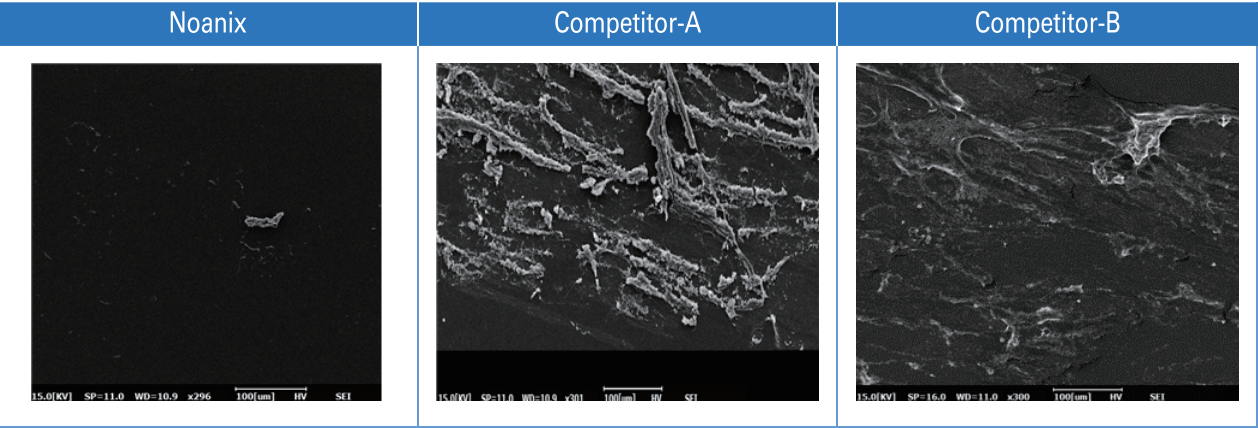
* Fluorescence staining of ECMO tubes coated with antithrombogenic coating

- Platelet attachment to inner surface of tube after in vitro circulation for 48hr.
- IF STAIN Confocal microscope inspection 40X



* SEM of ECMO tubes coated with antithrombogenic coating

- Platelet attachment to inner surface of tube after in vitro circulation for 48hr.



Sample name	Pump hour	the appearance of the coating being peeled off	Fibrin observation	Thrombus colony status	Presence of thrombosis
Noanix	48	1+	-	-	1+
Competitor-A	48	-	4+	4+	4+
Competitor-B	45	-	3+	3+	3+

* Flow cytometry of ECMO tubes coated with antithrombogenic coating

Sample name	Noanix		Competitor-A		Competitor-B	
	PRE circulation	POST circulation	PRE circulation	POST circulation	PRE circulation	POST circulation
Graph						
Total(%) CD61+ CD62P+	72.26	35.23	88.05	10.37	36.86	1.04
Reduction ratio(%)	51.2		88.2		97.2	

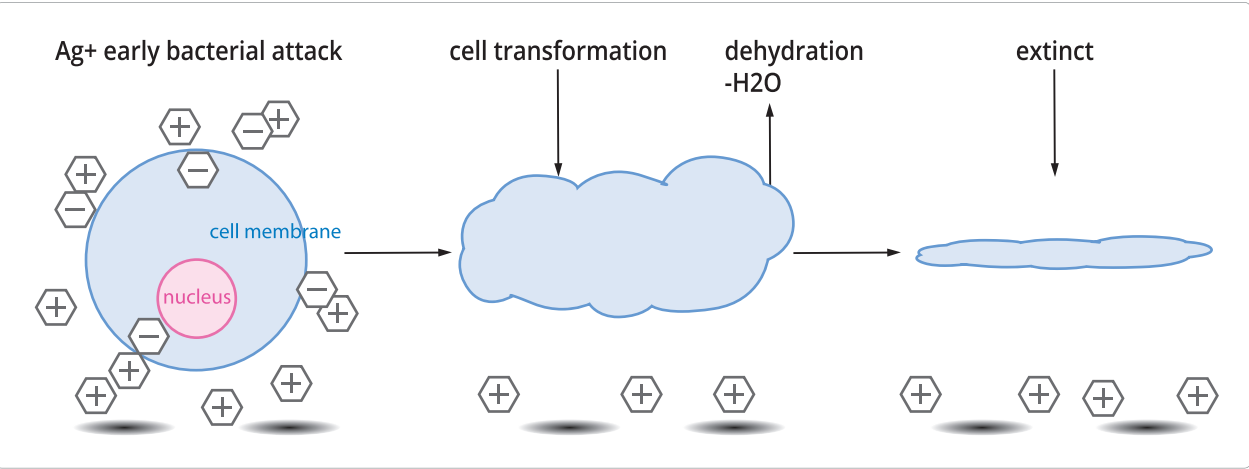
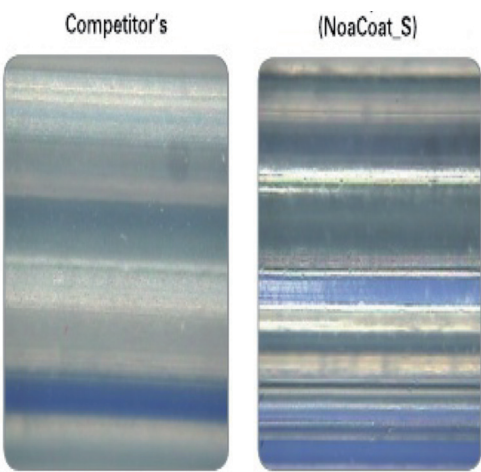
● Antimicrobial Coating

* Introduction

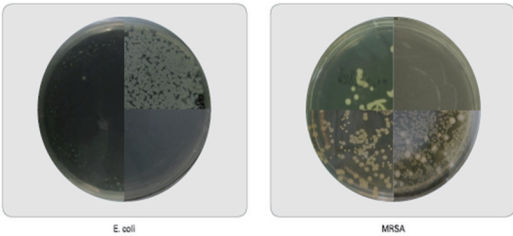
- Antimicrobial coating is used for the purpose of preventing the growth of bacteria.
- It can prevent nosocomial infections (HAIs) that can be caused by people and devices.

* Advantages

- Harmless to the human
- Not Toxic
- Inhibition of metabolic function of harmful bacteria
- Suppressing biofilm adhesion



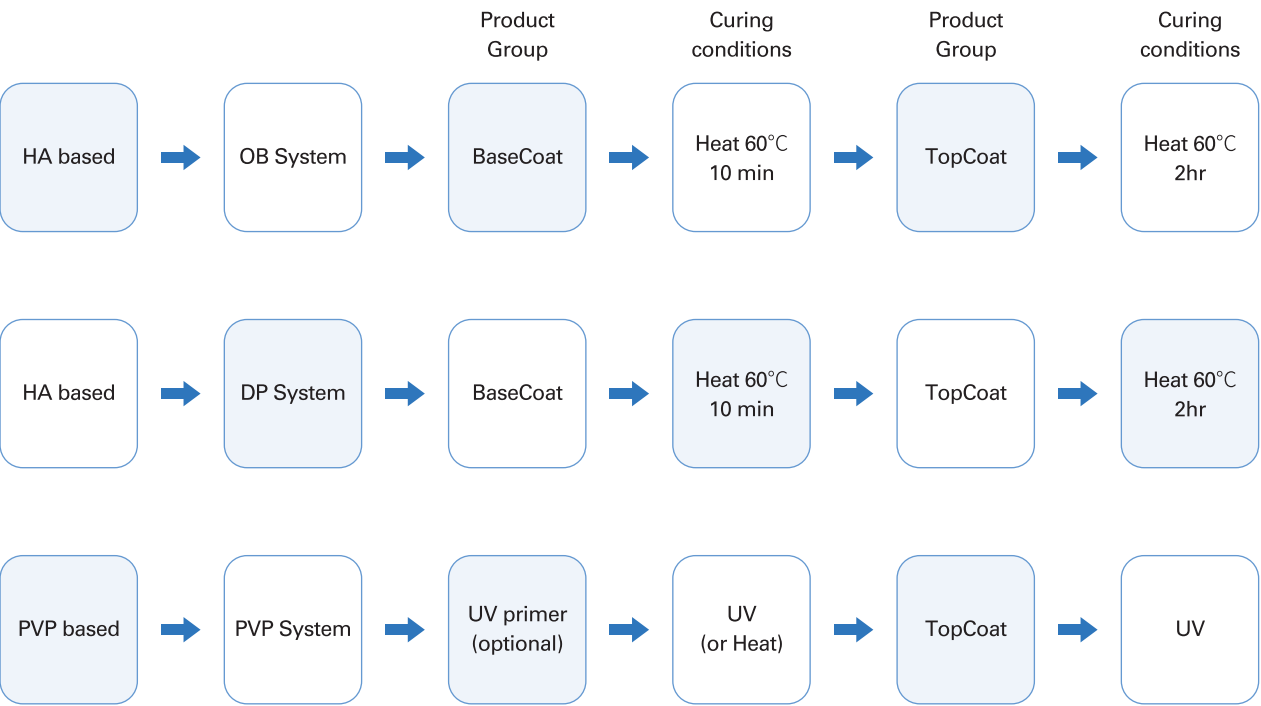
Samples	Abs	no. of microbe	Reduction Ratio
(Noanix_S)	0.002	1.6 X 10 ⁶	99.31%
Competitor	0.008	6.4 X 10 ⁶	97.25%



* Antibacterial Process

- Antibacterial substances adsorbs and binds thiol groups -SH and COO- or OH- ions in microbial bacterial proteins
- Condensation-dehydration reaction after cell deformation
- Due to bacterial metabolism and energy metabolic breathing problems, bacterial apoptosis is killed

● Coating system



● Advantages and Disadvantages

	Coating type	
	One Coating	Two Coating
Advantages	· Simple process · Saving coating cost	· High coating performance · Free from toxicity
Disadvantages	· Can be toxic · Containing harmful factors · Low coating · Performance	· Long process. · Less cost saving

	Curing type		
	Heat	IR	UV
Advantages	· Inner coating possible · Simple system · Low maintenance	· Short curing time	· Short curing time
Disadvantages	· Long curing time · Sensitive to · Temperature	· Inner coating difficult	· Inner coating difficult · Harmful UV light · Harmful photo initiator · High system and maintenance cost

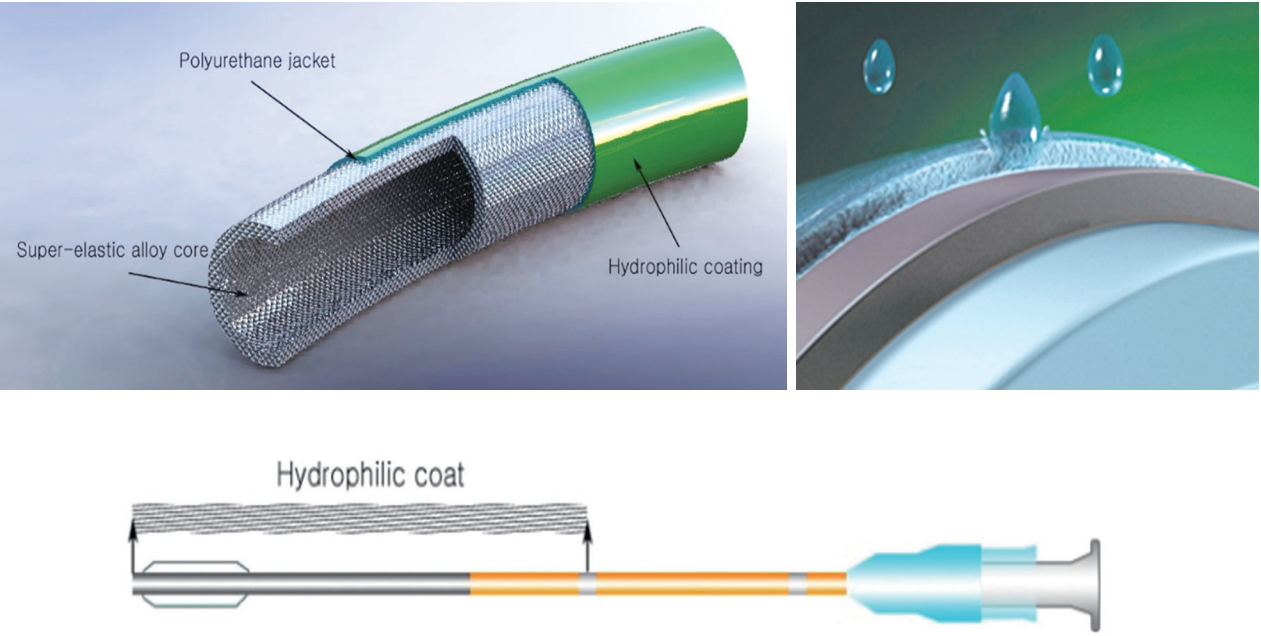
	HA	PVP/PU
Advantages	· Extremely biocompatible(Natural polymer) · Stable as a bilaminar coating · Stable to water · Very lubricious	· Relatively inexpensive · Flexible to formulate · Easy to handle · Short time of UV curing(PVP) · Convertible to UV curing to thermal curing or in reverse(PVP)
Disadvantages	· UV curing impossible · Contamination · Relatively expensive · No one(single) coating · Inflexible to formulate	· Low biocompatibility · Low stability to water(particularly PVP) · Highly viscous(PU)

● Applications examples

* Applications

- Stent
- Ballon
- Catheter
- Micro-catheter
- Guide wire
- Introducer
- Lead Wire
- Sheath
- IOL Cartridge
- Insertion sleeve
- Endoscope
- Vertebral Cage
- Mesh
- Microfluidic
- Suture
- Medical tube
- MEMS
- Blood contacting surfaces that require antithrombogenicity
- Sliding surfaces that require lubricity

* Ex) Guide wire, Balloon catheter etc..

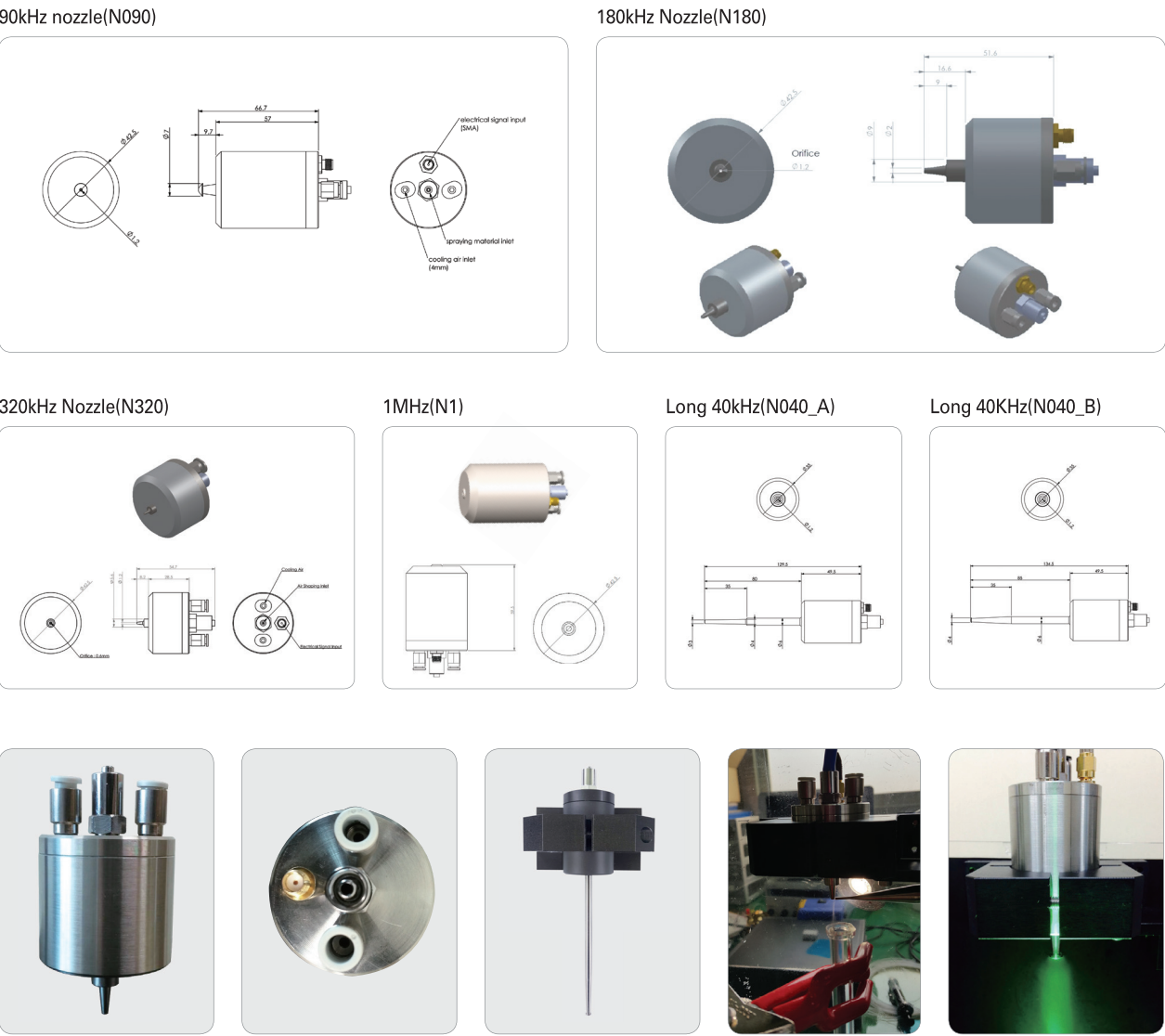


Devices

○ Ultrasonic Spray Nozzle Systems

* Benefits

- Reduced spray drop rate
- Consistent spray pattern
- Corrosion resistant construction
- Ultra low flow spray
- Control spray droplet size with frequency selection
- Choose tip shape to control different spray ranges



● Ultrasonic Spray Nozzle(USN)

* Specification

Model	Operating Frequency (kHz)	Maximum Flow Rate (ml/min)	Median Drop Diameter (microns)	Orifice Diameter (mm)	Weight (kg)	Droplet Uniformity (C.V)
LONG_N040A	40	5	30	0.8	0.3	< 0.1%
LONG_N040B	40	5	30	1.2	0.3	< 0.1%
N090	90	10	25	1.2	0.4	< 0.1%
N180	180	5	15	1.2	0.4	< 0.1%
N320	320	0.2	9	1.2	0.3	< 0.1%
N1	1(MHz)	0.1	5	0.6 (sidefeeding I.D)	0.3	< 0.1%

* Materials :

- Lead zirconate-titanate transducers
- Titanium alloy body
- 316 stainless steel housing
- Spraying material viscosity : < 50 cps

* Characteristics : Focus Width

Model	Focus Width (mm)
N180	0.8
N320	0.4
N1(1MHz)	0.2 or less

● Wide Jet

Specs	Wide vortex		Wide jet	
Spray pattern				
Frequency	90kHz	180kHz	90kHz	180kHz
Flow rate	Max 3ml/min	Max 1ml/min	Max 5ml/min	Max 1ml/min
Drop size	20~30um	10~20um	20~30um	10~20um
Generator	Digital/analog		Digital/analog	
Coating range	Max 100mm		Max 150mm	

● Generator for ultrasonic spray nozzles

* Ultrasonic Wave Generator

Type	U300 (analogue type)	U300D (digital type)
		
Frequency (kHz)	20 ~ 320(MHz)	20 ~ 220(MHz)
Output power (W)	Max. 10	Max. 99
Wave form	Sine wave	
Operating condition	Factory setting	User setting
Control type	· Open type · Voltage leveling	· Feedback amplifier power frequency control type · Power leveling · Driving frequency auto set at setting power level · Setting power level resolution: 0.1W · Auto save operating condition

○ Electropray nozzles/Air-assisted Nozzles

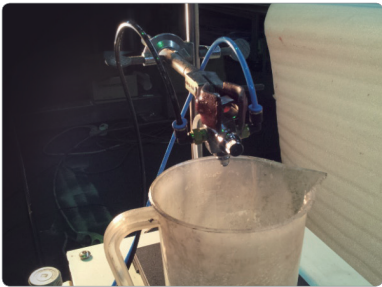
Noanix designs and provides custom electropray nozzles/Air-assisted nozzles for mainly low flow rates applications.

* Custom

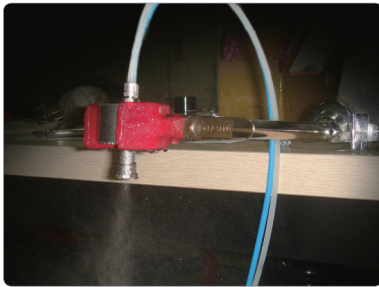
Noanix has designed and provided a lot of custom nozzles for specific applications. Below are some of examples.



150Bar high pressure, max. 20mL/min. flow rate for MicroMixing System



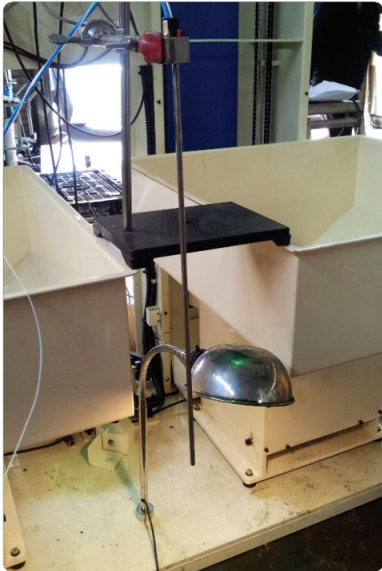
Nozzle for painting coating



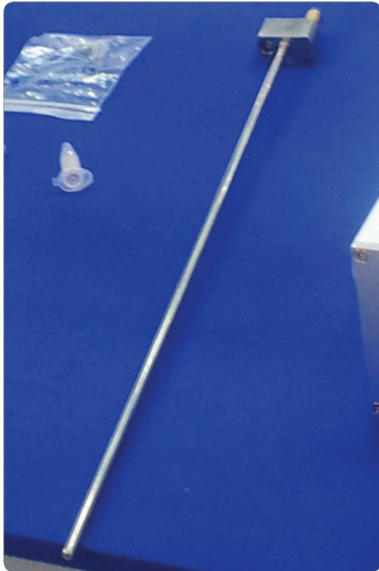
Valve type air nozzle for PCB Coating



Valve type air nozzle for PCB Coating



Long nozzle, 60cm, 1mL/min. flow rate for artificial vessel



Long Nozzle for Biomaterials Coatings

○ Ultrasonic Syringe Pumps(USP)



* Features of the USP Family of Syringe Pumps:

- Designed for deagglomeration of particles and catalyst slurries that is difficult to keep evenly dispersed in suspension
- kHz and MHz two frequency versions available
- Fully programmable; automation capable
- Operates stand-alone or from a computer
- Infusion and withdrawal
- Set a single pumping rate and/or dispensing volume
- Program up to 41 pumping phases that change pumping rates, set dispensing volumes, insert pauses, control and respond to external signals, sound the buzzer
- Network, control, and monitor up to 100 pumps with one computer
- Worldwide power supplies available
- Motor stall detection
- Dispensing accuracy of +/-1%
- Unlimited lifetime technical support
- One year warranty

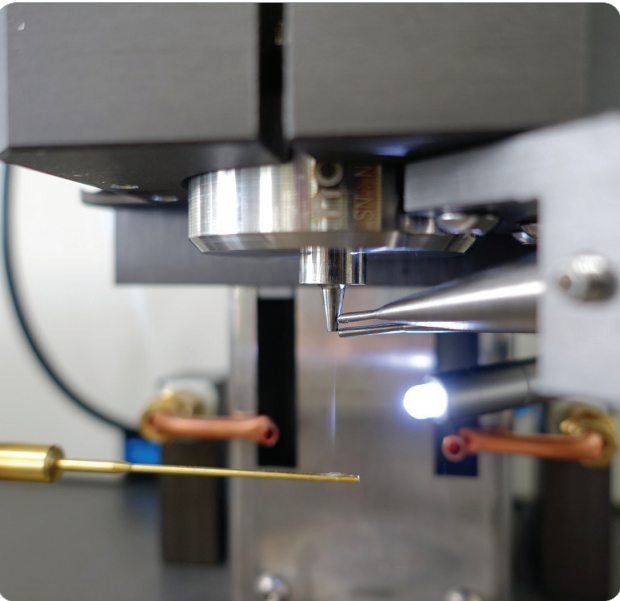
* Example Flow Rates: USP

Model	USP
Syringe Size	0.5 µL to 60ml
Power	100-240 VAC: 50/60 Hz, 50 W. 0.5 A fuse
Motor Drive Control	Microprocessor with 1/16 microstepping
Linear Force(Maximum)	13.6kg(30 lbs) @ 100% Force Selection
Number of Microsteps per One Revolution of Lead Screw	15,360
Step rate(Minimum)	27.5 sec/µstep
Step rate(Maximum)	26 µstep/µstep
Drive Motor	0.9 degree Stepper Motor
Pusher Travel Rate-(Minimum)	0.15 µm/min
Pusher Travel Rate-(Maximum)	159 mm/min
Flow Rate-(Minimum)	1.26 pl/min(0.5 µl syringe)
Flow Rate-(Maximum)	88.28 ml/min (60 ml syringe)
Dimensions	22.6 × 19.05 × 15cm(9 × 7.5 × 5in)
Weight	2.66kg(5.9lbs)
Connectors	RS-232 - 9 Pin D-Sub Connector, RS485 - IEEE-1394 6 pos, USB - Type B

○ Coaters(NoaCoater®)

● Spray Coaters

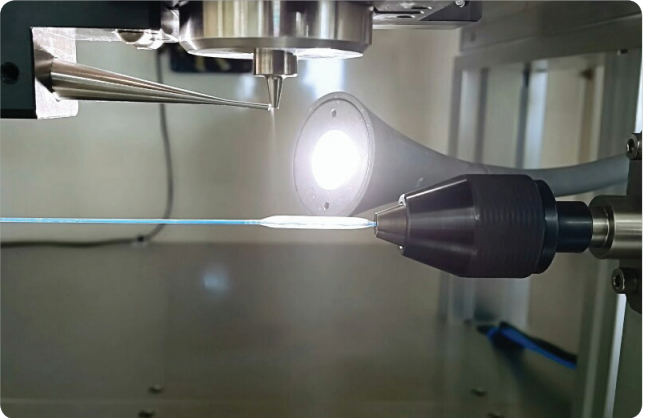
* NoaCoater for DES(Drug- eluting Stent)



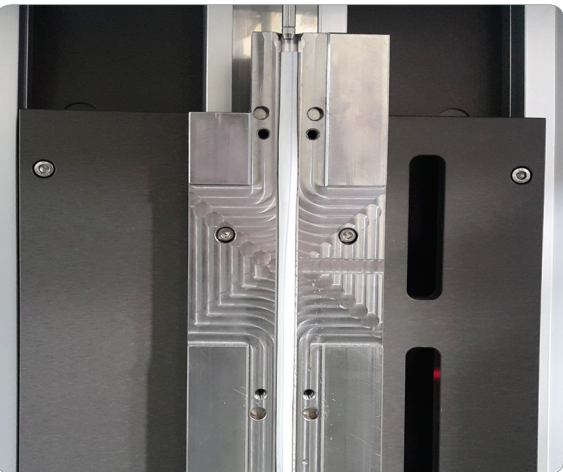
* UV Coater



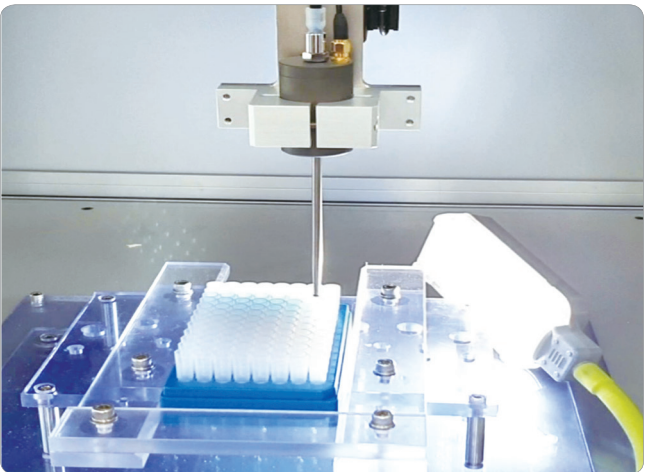
* NoaCoater for Balloon



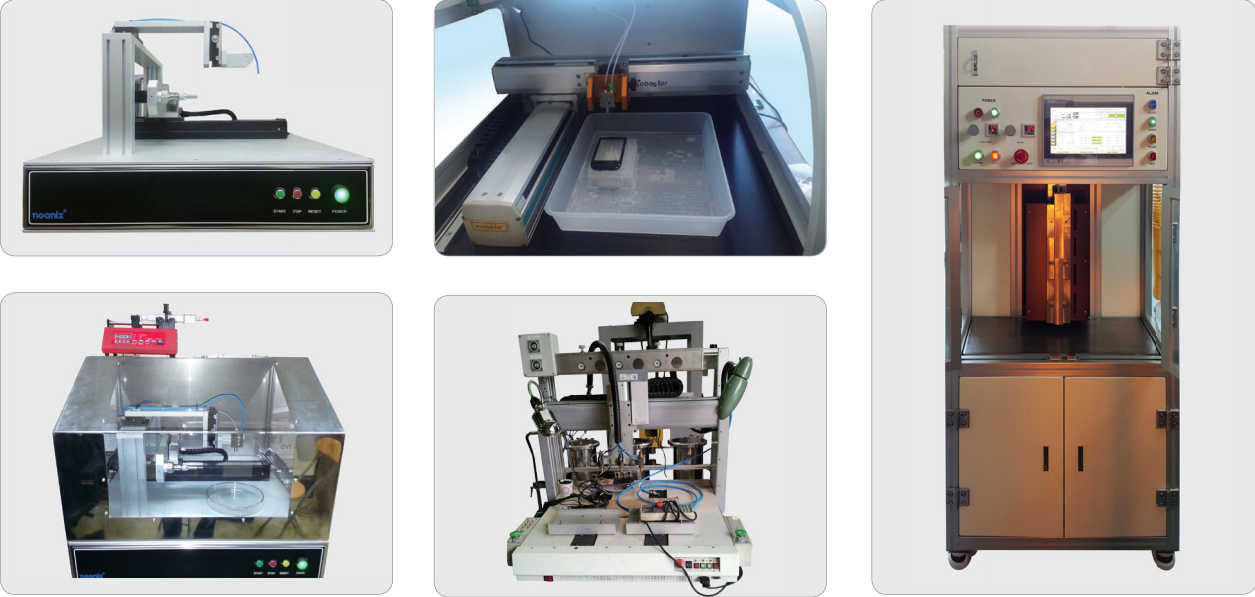
* NoaCoater for Artificial Blood Vessel



* NoaCoater for Blood Collection Tubing/Syringe



* Coating machines for various medical applications



● Dip Coaters

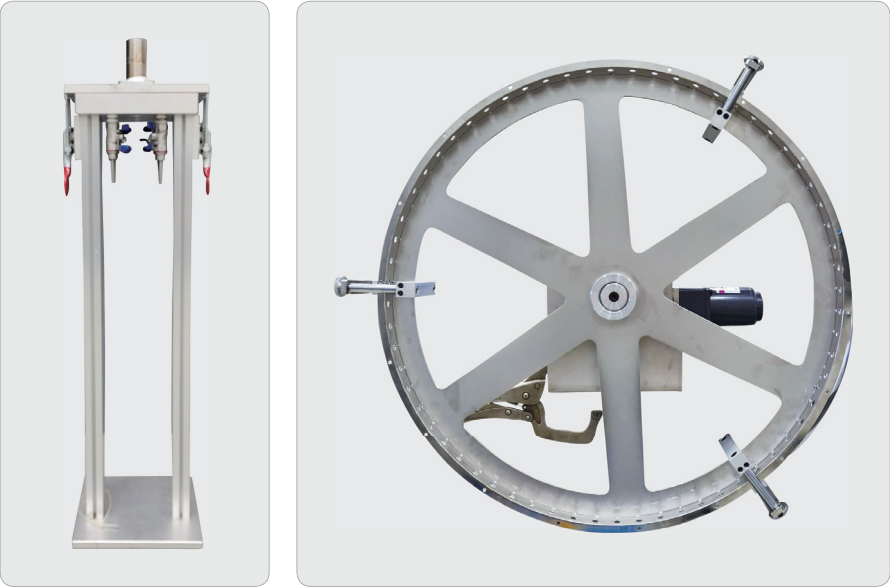
Dip Coaters are used mainly for hydrophilic Coatings and hydrophobic coatings(teflon coating). Their spec and design depends on coating process and coating solutions.



● Inner Coaters

Internal Coating System for hydrophilic coating

* For inside coating of a medical tube



Includes

- Size of 950 x 750 x 1150(Customized)
- Produces 9 Tubes at one time(Customized)

Housing Specifications

- Construction 316 stainless steel, aluminum

System Specifications

- **Control** : PID Control
- **Reservoir Volume** : 1.5 L (Customized)
- **Device & Coating Length** : max. 3m (Customized)
- **Coating Inner Diameter** : 3~35mm(Customized)

Requirements

- **Power** : 110-220VAC, 50/60Hz 20A (Customized)
- **Air Operating** : Minimum 20 psi

* For inside coating of IOL Cartridges



Includes

- **Size** : 950 x 750 x 1740 (Customized)
- Produces 100 cartridge at one time (Customized)

Specifications

- **Control** : PC Control
- **Reservoir Volume** : max. 1 L (Customized)
- **Coating length** : Customized
- **Coating Diameter** : Customized

Requirements

- **Power** : 110-220VAC, 50/60Hz 20A (Customized)
- **Air Operating** : Minimum 20 psi

● RolltoRoll machines

RolltoRoll dip coater for guide wire teflon coating



○ Curing machines

Heat	IR	UV
Conventional heat cure system	Infrared based oven, very short curing time	Ultraviolet based curing system, very quick curing time
		

○ Vacuum Plasma Systems

Custom designed vacuum plasma systems using RF power for medical devices

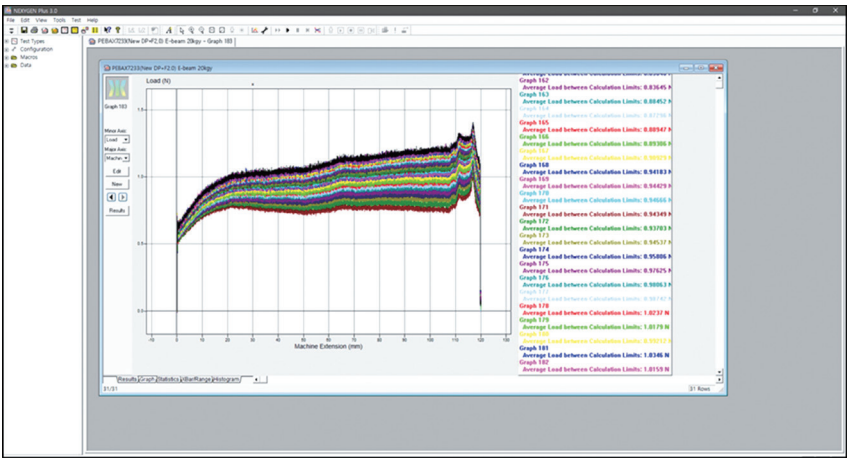


○ Friction Testers(FTFC)

Friction Tester for hydrophilic coatings and Teflon coating It shows coating's lubricity and durability.

- Testing length : 800mm
- Sample diameter : max.18mm
- Testing speed : 0.01-2,032mm/min. up to 100kgf
- Data printable

Various functions, conditions and figures input possible Including a PC, Printer, Air compressor

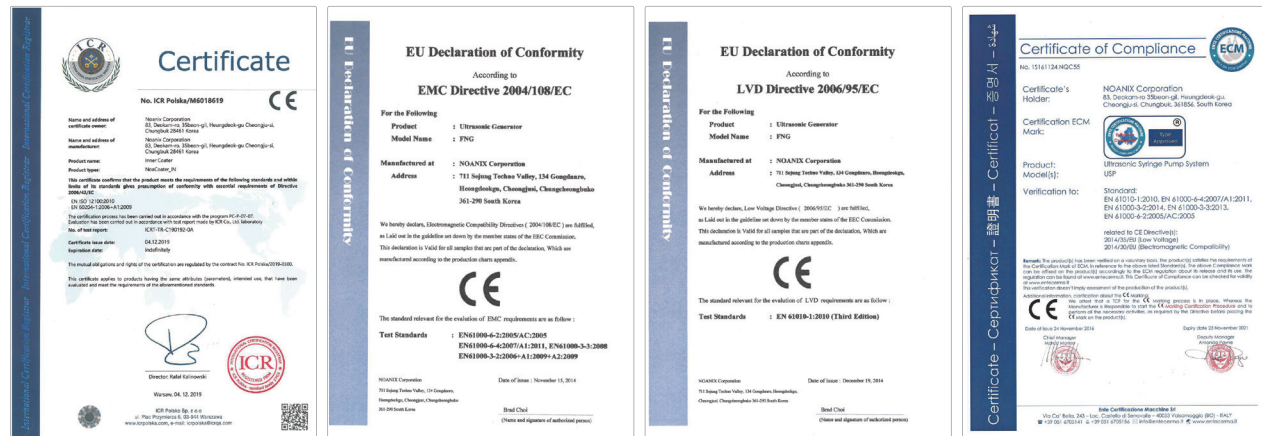


Certification

ISO

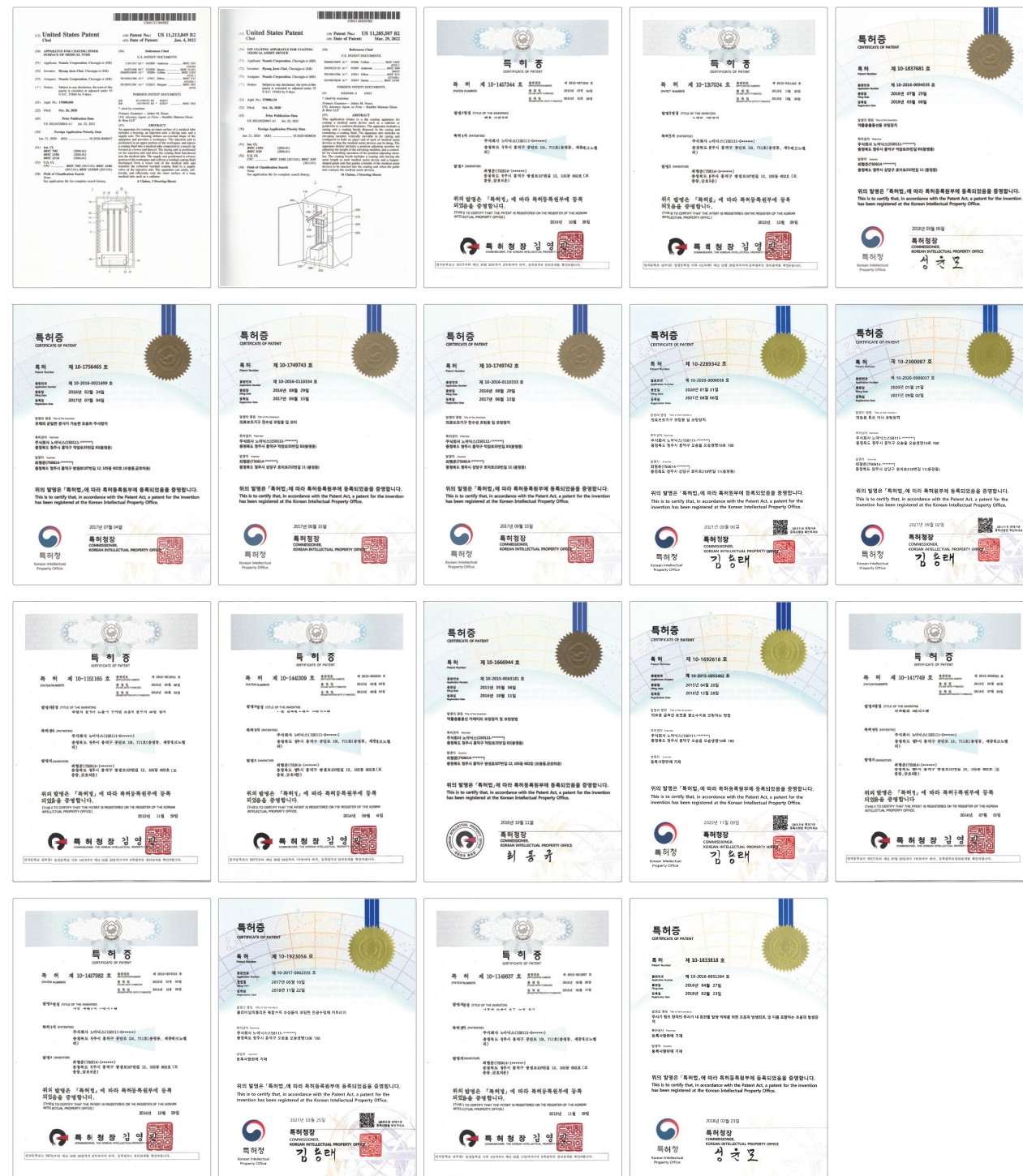


CE



Certification

Patent



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