DOMICRO

AUTOMATED
MICROSYSTEM
TECHNOLOGIES

DM50-ENP

ELECTRO-HYDRODYNAMIC NANOWIRE PRINTING (ENP)

DOMICRO

“REVOLUTIONARY INNOVATION FOR HYBRID ELECTRONICS”

FACILITATE YOUR IMAGINATION

DM50-ENP

INTRODUCING NEW POSSIBILITIES IN RESEARCH

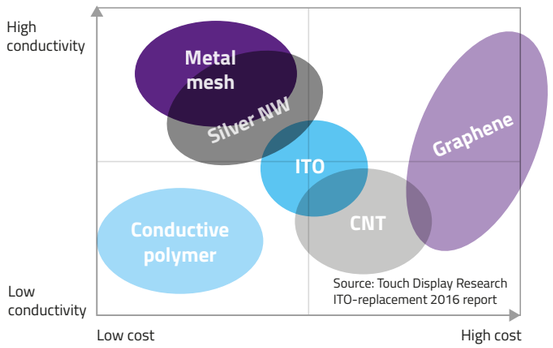
DoMicro presents a new nanowire printing platform and Electro-hydrodynamic Nanowire Printing (ENP) Technology for hybrid electronics: the DM50-ENP. Based on electrospinning technology as known for decades and commonly used for filters and non-woven textile industry. Now the DM50-ENP features a direct write mode for near field electrospinning. The DM50-ENP is based on the versatile and proven R&D inkjet printer platform from Meyer Burger Netherlands PiXDRO LP50. This platform is around for already a decade. It creates breakthroughs in printing technology due to the high accuracy and versatile system architecture.

By direct write mode and under high voltage, nano-wires made from multiple sorts of polymers can be applied and positioned on substrates in a highly controlled manner. Recent material and process developments by The Dow Chemical Company opens up new and unprecedented possibilities for conductive and transparent structures, patterns and substrates.

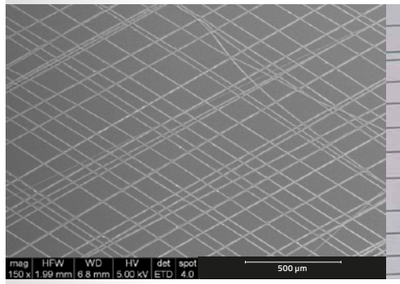
APPLICATIONS

With conductive silver nanowires applied by DM50-ENP, all kinds of applications in electronics become feasible: OLED / OPV Electrodes, Trans-parent Conductive Films (ITO replacement), Transistors on flexible substrates and for instance Transparent Heater. Research can be performed and explored in fields like:

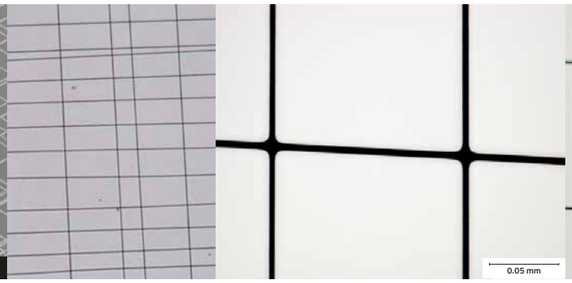
- Touch Screens
- Batteries
- Memory
- Bio chips
- MEMS technology
- Micro Filters



METAL MESH VIA ENP TECHNOLOGY



Coaxial nanowire printing (co-ENP)



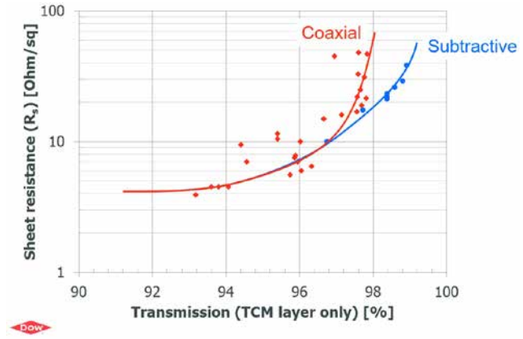
Subtractive nanowire printing (sub-ENP)

Metal mesh can be created in direct write mode by coaxial polymer-AgNP ink or by using a subtractive method via masking and lithography.

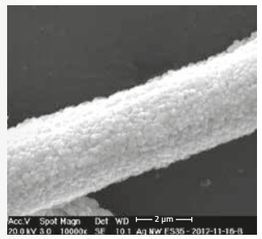
INK DEVELOPMENT

New, unique, proprietary silver nanoparticle (AgNP) inks and electrospinning deposition technology have been developed by The Dow Chemical Company.

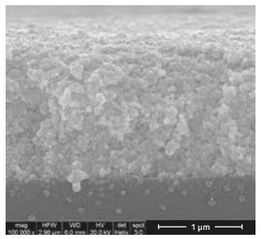
- Inks are optimized for ENP technology and R & D on the DM50-ENP.
- These inks have tunable properties, especially a significantly improved balance of low viscosity and silver loading vs. incumbent inks.
- Dow ink allows for easier processing and more volume of silver per drop.
- The inks can be sintered to high conductivity using typical photonic or thermal sintering methods.
- The process in combination with the inks enables deposition of narrow lines and is also suitable for large substrates (≥ 50 inch) keeping excellent transmission, resistivity and haze.



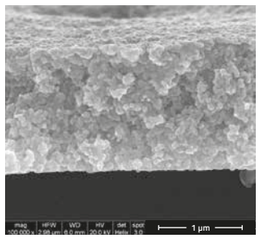
Comparing commercial AgNP inks to Dow ink			
Ink	Normalized metal loading	Normalized viscosity	Normalized resistivity
Dow AgNP ink	1	1	1
Commercial ink A	0.29	0.46	4.49
Commercial ink B	0.84	1600	1.92



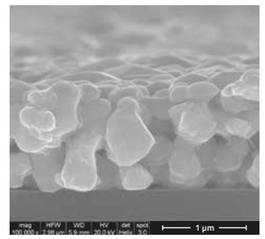
Scanning Electron Micrograph of Electrospun AgNP Fiber



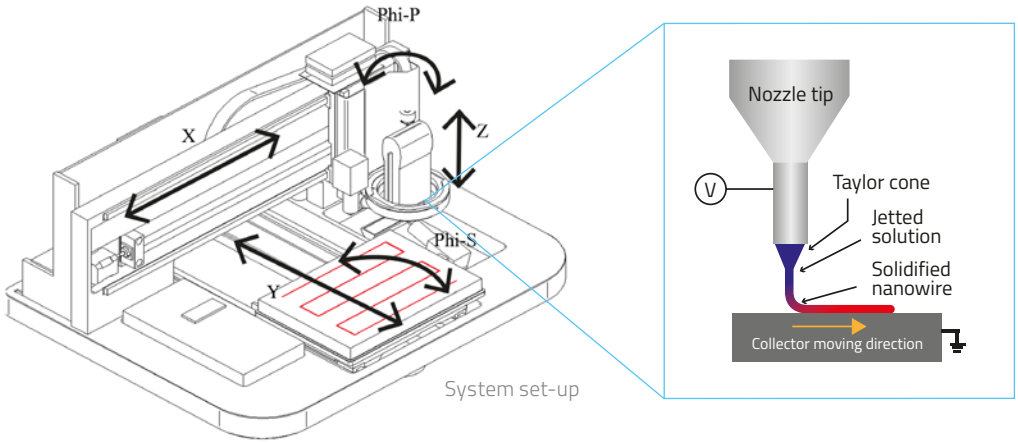
Non-sintered



Photonically sintered



Thermally sintered
Bulk resistivity comparison
ρ(thin film) / ρ(bulk Ag) = 2



System set-up

ENP nanowire printing technology is a new and innovative application field. The DM50-ENP platform enables further research and applications in additive technologies for hybrid electronics. Several polymers like PVDF, PVA are applicable out of solutions or liquids with viscosities from 1 ~ 50.000 cPs yielding nanowires ranging from sub-micron to micron diameters.

GENERAL SPECIFICATIONS

System	Property	Value
DM50-ENP	W x D x H	Approx. 768 x 621 x 410 mm
	Weight	Approx. 90 kg
Utilities	Power	110-240 VAC; 50/60 Hz; 1kVA
Substrates	Max size	327 x 227 mm
System Accuracy	X-Y axis Repeatability	± 5µm 3σ
Y-axis Direct drive	Velocity	Max 500 mm/sec
X-axis Stepper motor driven	Velocity	Max 200 mm/sec
Z-axis Stepper motor driven	Repeatability	± 5µm 3σ
Rotate Substrate Table on Z-Axis	Stroke	-1° / 1°

PRINTING TYPES

Comparison	Printing type	Resolution (µm)	Speed (m/min)	Equipment Cost	Material Consumption
Gravure	Direct contact	10 - 30	Fast (~1000)	Large	Middle
Offset	Indirect contact	~10	Fast (~1000)	Large	Large
Flexo	Indirect contact	~50	Fast (~500)	Large	Middle
Screen	Direct contact	~50	Middle (~50)	Large	Middle
Nanoimprint	Direct contact	< 0,1	Slow	Middle	Middle
Aerosol	Continuous jet	10 - 30	Middle	Small	Small
Inkjet	DOD jet	10 - 30	Slow	Small	Small
EHD jet	DOD jet	< 5	Slow	Small	Small
E-Nanowire	**Continuous nozzle**	**< 1**	**Middle**	**Small**	**Small**

PARTNERS

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DOMICRO

DOMICRO COMPANY PROFILE

DoMicro BV is a technology company creating value by additive technologies in electronic manufacturing. DoMicro provides the competitive edge with respect to time to market, total costs, ramp up volumes and your secured IP position. If you are challenged by the market and looking for a partner to move your ideas into realization, contact us. We really do facilitate your imagination.

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