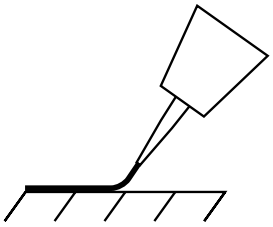
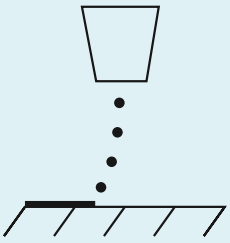
XTPL®

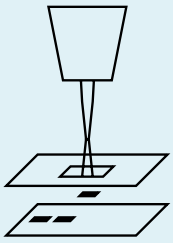
shaping global nanofuture



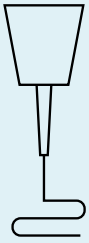
XTPL® Ultra-Precise Deposition



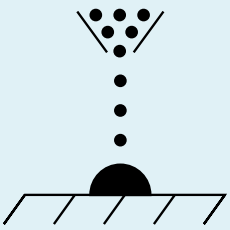
Inkjet



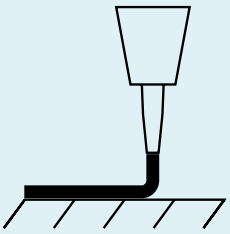
LIFT



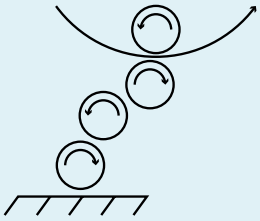
Extruders



Aerosol jet



Direct ink writing



Flexography

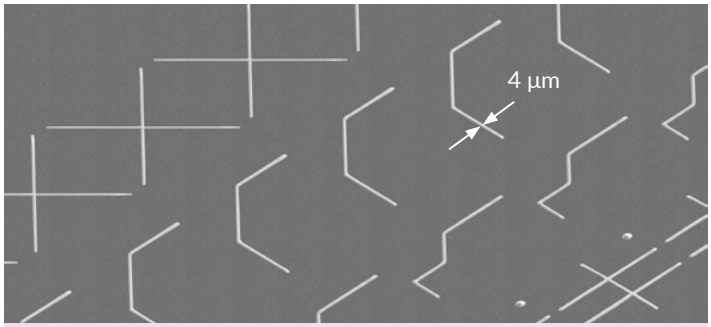
NANOINKS

Developing highly concentrated metallic inks that overcome dispensing size limitations.

Bringing premium products to the market.

COMPANY & TECHNOLOGY

XTPL is developing globally innovative, additive manufacturing technology that enables ultra-precise printing of nanomaterials. The company provides XTPL® Delta Printing System with Ultra-Precise Deposition (UPD) technology bringing the capability of printing high resolution features down to 1 µm. The unique portfolio of XTPL® conductive inks allows to obtain conductive submicron structures on a variety of substrates with diverse printing methods.

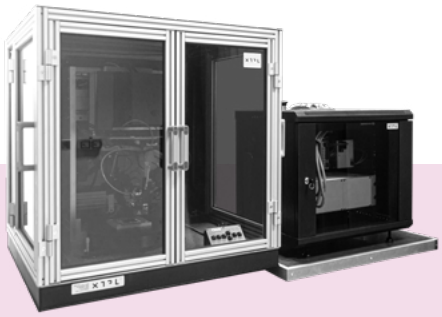


XTPL® ULTRA-PRECISE DEPOSITION TECHNOLOGY (UPD)

the patented technology of printing fine features, even on complex topographies

XTPL® CONDUCTIVE INKS

highly-concentrated silver inks characterised by superior stability and homogeneity.

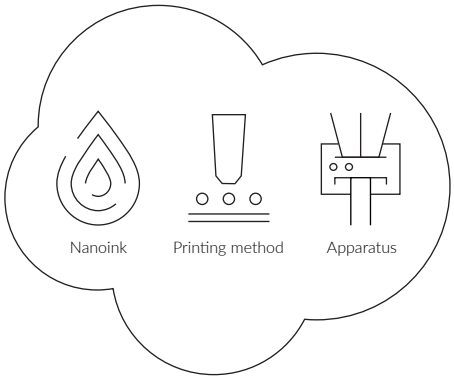


XTPL® DELTA PRINTING SYSTEM

high-precision rapid prototyping printing system for microelectronics

XTPL SERVICES

the services in the field of the proof of concept projects



INTELECTUAL PROPERTY

XTPL builds a strong and versatile patent portfolio to protect our inventions in the areas of the printing equipment and printing processes, software development, specific industrial applications, as well as inks.

Contact us to get more information

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XTPL® NANOINKS BENEFITS

Working on our breakthrough ultra-precise printing technology, we developed highly-concentrated silver inks (up to 85 wt.%) characterised by superior stability and homogeneity. It is possible to extrude these inks through micrometer nozzles (even 0.5 µm) without the risk of clogging. Our inks are suitable for advanced applications and 3D printed electronics.

FEATURE	BENEFIT
Ultra-precise printing	Ink deposition in micron scale using micronozzles and microchannels or nanoimprint lithography.
High metal content (30-85 wt.%)	High resolution printing (1-50 µm feature size) even on non-planar substrates.
Superior homogeneity and stability	Highly concentrated inks can be extruded through microchannels and nozzles as narrow as 1.0 µm, enabling deposition of homogenous thin lines.
Multiple surfaces	Inks can be deposited on nearly any type of rigid or flexible substrate, including glass, silicon nitrides, silicon oxides, foils (e.g. Kapton, PET, PEN, PDMS) or silicon wafers.
Compatibility with a wide range of polar solvents	Rheological properties of the ink can be easely modified by mixing with many solvents.
Thermal (100-300°C) or photonic (laser, flash) sintering	Very low ink resistivity (>3.25 x10^{-8} Ω•m, 50 % of Ag bulk conductivity).
Anticlogging behavior	Extremely long nozzle lifetime (2.5 µm nozzle opening, even more than 1 month of printing).

PRINTING METHODS COMPATIBILITY

	INKJET	AEROSOL JET	FLEXOGRAPHY	DIRECT INK WRITING	LIFT	EXTRUDERS	XTPL® ULTRA-PRECISE DEPOSITION
CL34 Ag content - 30 wt.% Viscosity - 200-400 cP		√	√		√		√
IJ36 Ag content - 34 wt.% Viscosity - 26-30 cP	√						
CL60 Ag content - 56 wt.% Viscosity - 30 000-50 000 cP				√	√		√
CL85 Ag content - 82 wt.% Viscosity - > 100 000 cP				√	√	√	√

Ag Nanoink IJ36

Conductive Silver Ink

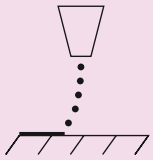
UNIQUE FEATURES

- superior printing stability - over 1 month of continuous work with repeatable results, and without clogging of the nozzles, even with the smallest 1 pL cartridges available for Dimatix DMP-2850 Printer
- high electrical conductivity - over 40% of bulk Ag conductivity
- compatibility with various substrates - performance demonstrated on e.g. Kapton 500HN, PET, PEN, PEI, Glass substrates

TYPICAL PROPERTIES

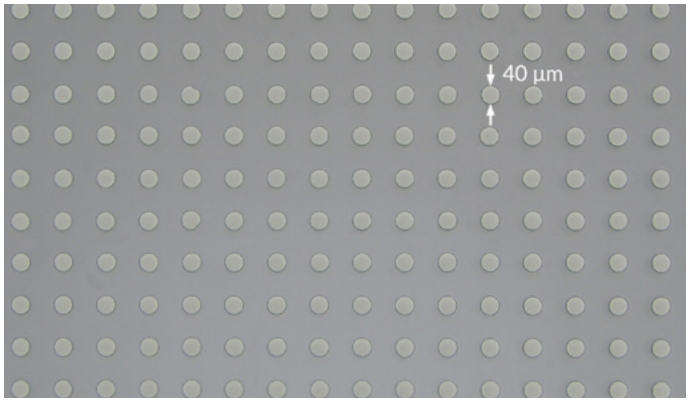
Silver content (wt. %)	32 ± 2
Density [g/cm^3]	1.2 - 1.4
Average nanoparticles size [nm] (TEM)	35 - 50
Shape of nanoparticles	Spherical
Electrical resistivity [Ω.m]*	$3.95 \cdot 10^{-8}$
Viscosity (25°C, shear rate = 0.2 s^{-1}) [cP]	26 - 30
Surface tension [mN/m] (25°C)	30
Solvent(s)	Glycol ether

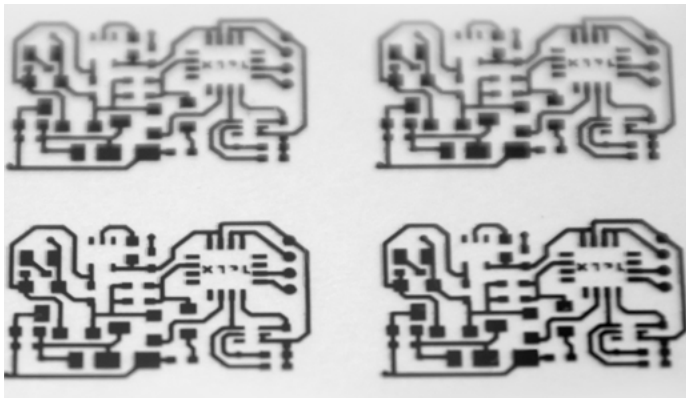
SUITABLE FOR

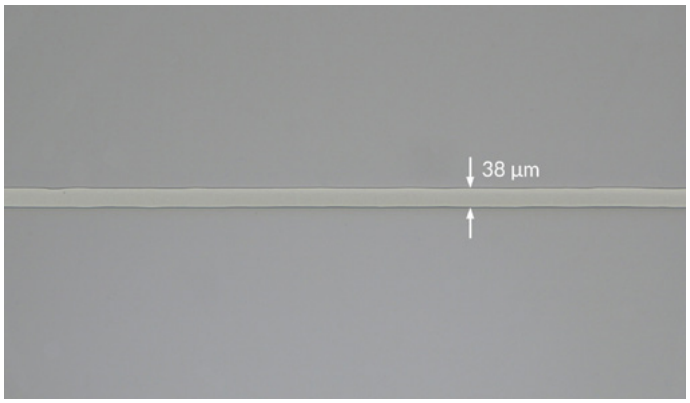


Inkjet

EXAMPLES OF INKJET PRINTED STRUCTURES USING THIS PRODUCT







Ag Nanoink CL34

Conductive Silver Ink

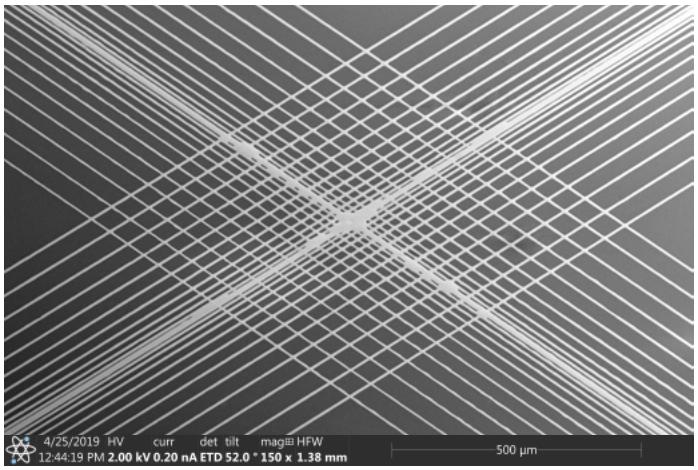
UNIQUE FEATURES

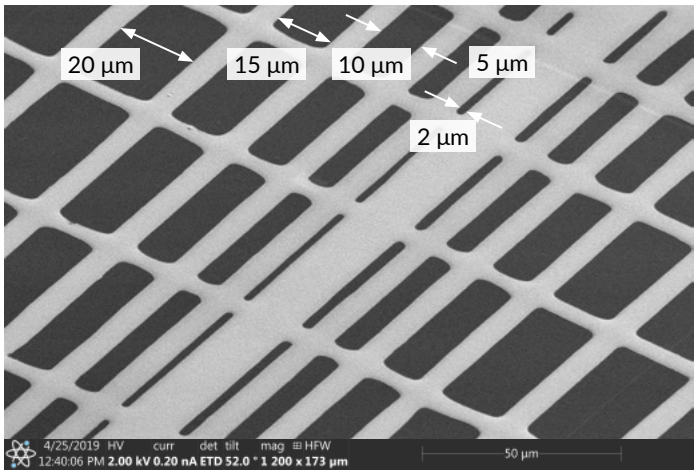
- up to 50% bulk silver conductivity, even at low silver concentration
- printable on foils for the manufacturing of flexible electronics
- suited for applications where low aspect ratio profiles are searched or necessary

TYPICAL PROPERTIES

Silver content (wt.%)	30 ± 2
Density [g/cm³]	1.50 ± 0.05
Average nanoparticles size [nm] (TEM)	35 - 50
Shape of nanoparticles	Spherical
Electrical resistivity [Ω.m]*	$3.25 \cdot 10^{-8}$
Viscosity (25°C, shear rate = 0.2 s^{-1}) [cP]	200 - 400
Solvent(s)	Glycol(s)

EXAMPLES OF THE STRUCTURES PRINTED USING ULTRA-PRECISE DEPOSITION





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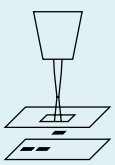
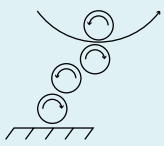
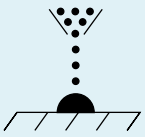


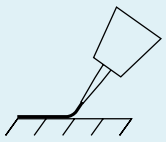
LIFT



Flexography



Aerosol jet



XTPL® Ultra-Precise Deposition

Ag Nanoink CL60

Conductive Silver Ink

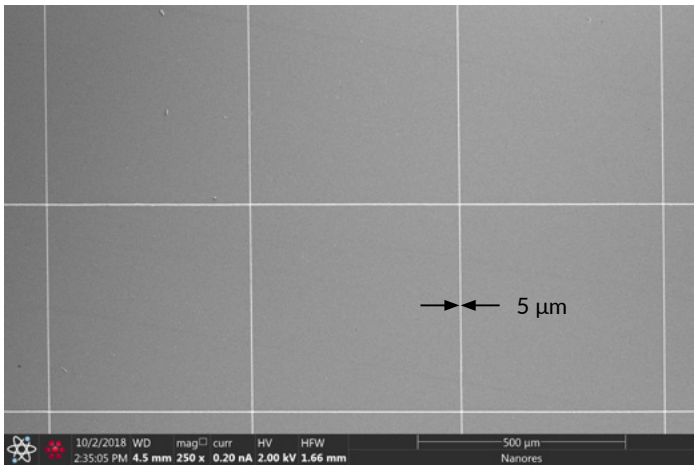
UNIQUE FEATURES

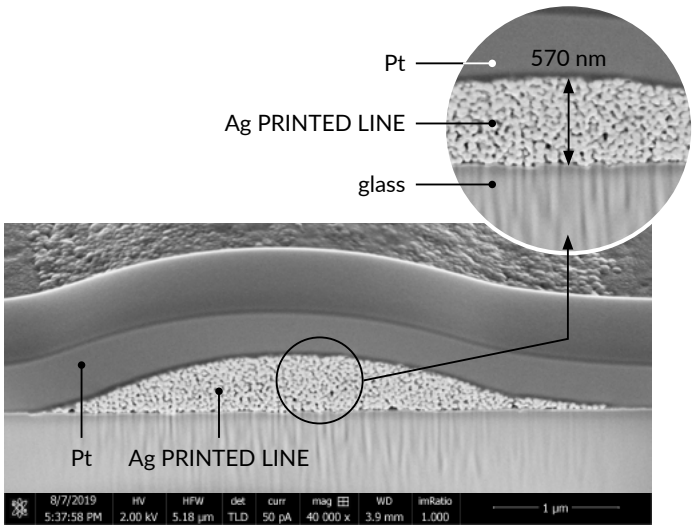
- high viscosity product, enabling the printing of fine features with higher aspect ratios
- easy dispensing, with rheological properties specifically designed for XTPL® Ultra-Precise Deposition and Direct Ink Writing methods

TYPICAL PROPERTIES

Silver content [wt. %]	56 ± 2
Density [g/cm³]	2.00 ± 0.15
Average nanoparticles size [nm] (TEM)	35 - 50
Shape of nanoparticles	Spherical
Electrical resistivity [Ω.m]*	$5.11 \cdot 10^{-8}$
Viscosity (25°C, shear rate = 0.2 s^{-1}) [cP]	30 000 - 50 000
Solvent(s)	Glycol(s)

EXAMPLES OF THE STRUCTURES PRINTED USING ULTRA-PRECISE DEPOSITION





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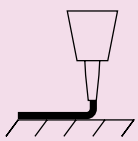
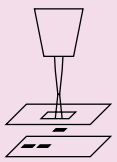


Direct ink writing



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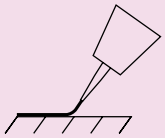


XTPL® Ultra-Precise Deposition

Ag Nanoink CL85

Conductive Silver Paste

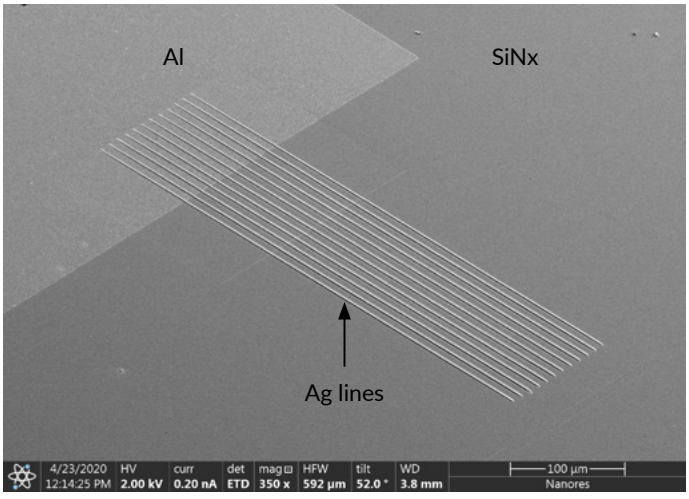
UNIQUE FEATURES

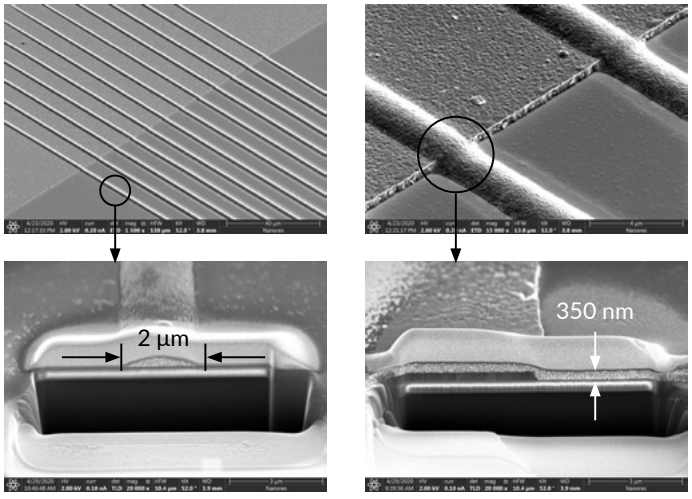
- very high viscosity product, enables the printing of ultrafine features of high aspect ratios
- displays unmatched non-clogging properties, allows long nozzle lifetime (2.5 µm nozzle opening, even more than 1 month of printing)
- dispensable through capillaries as narrow as 1 µm size, resulting in the deposition of homogeneous thin lines

TYPICAL PROPERTIES

Silver content [wt. %]	82 ± 2
Average nanoparticles size [nm] (TEM)	35 - 50
Shape of nanoparticles	Spherical
Electrical resistivity [Ω.m]*	$4.2 \cdot 10^{-8}$
Viscosity (25°C, shear rate = 0.2 s^{-1}) [cP]	> 100 000
Solvent(s)	Glycol(s)

EXAMPLES OF THE STRUCTURES PRINTED USING ULTRA-PRECISE DEPOSITION





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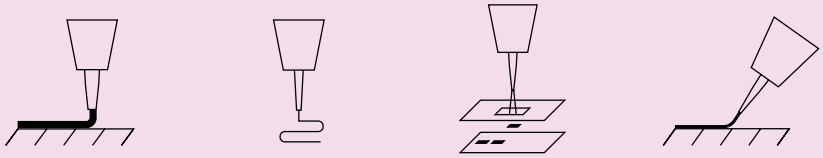

Direct ink writing | Extruders | LIFT | XTPL® Ultra-Precise Deposition

shaping global nanofuture

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XTPL is a globally innovative company developing breakthrough, additive manufacturing technology for ultra-precise printing of nanomaterials. XTPL® is the registered trademark of XTPL S.A.

Contact us for more details.

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xtpl.com