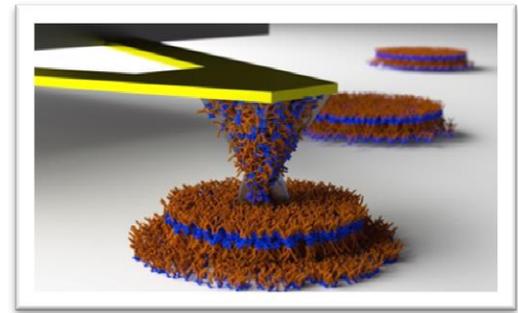


0 - Dip pen nanolithography (DPN) service

DPN is desktop nanolithography technique.

DPN is an attractive option for prototyping because it can fabricate nanopatterns at a fraction of EBL costs (no vacuum, no UV or aggressive chemicals). We offer Equipment and scientific expertise to write nanopatterns on surfaces using dip pen nanolithography



BALTFAB DPN EQUIPMENT

- a) Veeco CPIX (environmental chamber control temperature, humidity, nitrogen atmosphere on request).
- b) JPK Nanowizard 3 (high resolution, imaging in liquid)
- c) Single pattern is up to $100 \times 100 \mu\text{m}^2$, cantilever array increases throughput.
- d) Feature size very much depend on ink substrate interaction and can vary from 50nm up to a few μm .

BALTFAB DPN EXPERTISE

We specialize in patterning of various short bifunctional molecules on gold, silicon dioxide or polymer coatings for biotechnological applications. We have perfected all popular immobilization strategies:

- a) Carboxyl, NTA, biotinyl and other bifunctional thiols on gold
- b) NTA, biotinyl amines or NHS compounds on hydrogel coatings
- c) Lipids (DOPC, cholesterol etc) and transfection mixtures on glass slides or polymer coatings

UNCONVENTIONAL FABRICATION

Combination of DPN with other Baltfab or customer fabrication techniques can add nanodimension to microstructured chip or complement product development.

- a) Nanoelectrodes, DPN + electrochemical gold etching. DPN pattern acts as a resist during electrochemical etching.
- b) Lithography master. DPN + electrochemical etching + reactive ion etching
- c) Multilayer patterns. Combination of DPN with microcontact or ink-jet printing can introduce chemical nanopatterns on prestructured micropattern. For example cell adhesive micropatterns can be additionally nanopatterned with receptor proteins or antibodies.
- d) DPN + polymerization. Selective growth of hydrogel on MHA thiol patterns.

BALTFAB LABORATORY OF INK DESIGN

Our chemical synthesis facility offers synthesis of custom DPN inks or additional purification of commercial chemicals.

BALTFAB DPN QUALITY CONTROL

DPN patterns are verified using high resolution AFM, imaging ellipsometry or optical/fluorescence microscopy techniques.

3 – Specifications

We currently offer the following surface functionalizations:

Surface functionalizations (hF – hydrophobic, hP - Hydrophilic)

Substrate:	Au	Glass/Si		Plastics	Hydrogel	Comments
		Amine	Maleimide			
Functional end group						
Fluor-thiol (hF)	✓		✓	?	✓	
CH3 ligands (hF)	✓	✓	✓	?	✓	
Carboxylic (hP)	✓		✓	?	✓	
Amine (hP)	✓		✓	?	?	
PEGs (slightly hF)	✓		✓	?	?	
Lipids	✓ low eff	✓	✓	✓	?	
Protein selective						
NHS-Biotin	✓	✓	✓	?	✓	
NTA	✓	✓	✓	?	✓	

We do not allow silane into dip pen system, as it contaminates the AFM head.

DPN specifications

Writing speed	0.01 to 20 $\mu\text{m/s}$	<i>Depends on ink's ability to adhere to the surface</i>
Feature size	50 nm – few μm	<i>ink dependent</i>
Writing area	100x100 μm	<i>AFM scan area</i>
Max sample curvature	8 μm	<i>AFM scan height</i>
Min Ink volume	50 μl	<i>Inkjet printing available</i>
AFM tips	Si₃N₄	<i>PEG, Amine coatings available</i>