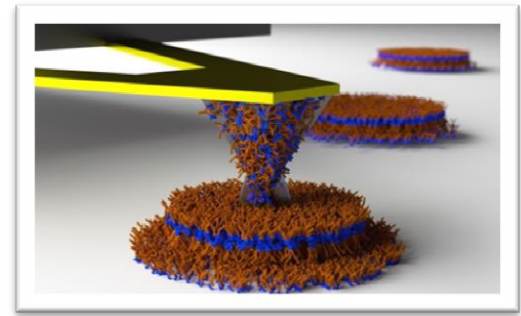


## 0 - Dip pen nanolithography (DPN) service

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  $\mu\text{m}$ .

### 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			
<b>Functional end group</b>						
Fluor-thiol (hF)	✓		✓	?	✓	
CH3 ligands (hF)	✓	✓	✓	?	✓	
Carboxylic (hP)	✓		✓	?	✓	
Amine (hP)	✓		✓	?	?	
PEGs (slightly hF)	✓		✓	?	?	
Lipids	✓ low eff	✓	✓	✓	?	
<b>Protein selective</b>						
NHS-Biotin	✓	✓	✓	?	✓	
NTA	✓	✓	✓	?	✓	

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

### DPN specifications

Writing speed	<b>0.01 to 20</b> $\mu\text{m/s}$	<i>Depends on ink's ability to adhere to the surface</i>
Feature size	<b>50</b> nm – few $\mu\text{m}$	<i>ink dependent</i>
Writing area	<b>100x100</b> $\mu\text{m}$	<i>AFM scan area</i>
Max sample curvature	<b>8</b> $\mu\text{m}$	<i>AFM scan height</i>
Min Ink volume	<b>50</b> $\mu\text{l}$	<i>Inkjet printing available</i>
AFM tips	<b>Si<sub>3</sub>N<sub>4</sub></b>	<i>PEG, Amine coatings available</i>

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