

## Polymer Patterning by Dip Pen Nanolithography

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**Abstract :** Dip Pen nanolithography (DPN), which is a tip based method, serves a novel approach to produce nano and micro-scaled patterns due to its high resolution and pattern flexibility. It is introduced as a new constructive scanning probe lithography (SPL) technique. DPN delivers materials in the form of an ink by using the tip of a cantilever as pen and substrate as paper in order to form surface architectures. First studies rely on delivery of small organic molecules on gold substrate in ambient conditions. As time passes different inks such as; polymers, colloidal particles, oligonucleotides, metallic salts were examined on a variety of surfaces. Discovery of DPN also enabled patterning with multiple inks by using multiple cantilevers for the first time in SPL history. Specifically, polymer inks, which constitute a flexible matrix for various materials, can have a potential in MEMS, NEMS and drug delivery applications. In our study, it is aimed to construct polymer patterns using DPN by studying wetting behavior of polymer on semiconductor, metal and polymer surfaces. The optimum viscosity range of polymer and effect of environmental conditions such as humidity and temperature are examined. It is observed that there is an inverse relation with ink viscosity and depletion time. This study also yields the optimal writing conditions to produce consistent patterns with DPN. It is shown that written dot sizes increase with dwell time, indicating that the examined writing conditions yield repeatable patterns.

**Keywords :** dip pen nanolithography, polymer, surface patterning, surface science

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