Cantilever-free Techniques and Tools for Delivering Materials and Energy to Surfaces

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The conventional photon and electron beam based lithographic techniques used for electronics and optics have been explored to pattern various vulnerable molecules that are interested in both chemistry and biology. Creating nanostructures over 1-1000 nm length scales with controlled size, shape and chemical compositions is essential for a wide variety of applications including electronics, optics, chip-based bioassays, and high-throughput screening. In recent development, new technologies have been invented to enable nanopatterning over large areas in low cost for practical device applications, such as interference photolithography, roll-to-roll nanoimprint lithography (R2R NIL), block copolymer nanolithography (BCPN), scanning-probe-based polymer pen lithography (PPL), and beam pen lithography (BPL). In this research topic we will discuss the approaches to macroscopic-area patterning of nanoscale features, including the direct patterning of inorganic or polymeric materials, the directed assembly of pre-synthesized functional materials into well-organized arrays, and the combination of different top-down and bottom-up patterning strategies for new capabilities. More importantly, we welcome discussions on the recent applications that are realized by these patterning tools, such as light management in solar cells, printed electronics, microbattery, information storage, 3D printings, stimuli-responsive surface architectures, sensors based on surface-enhanced Raman scattering (SERS), biomolecular arrays, and studies on cell-material interactions.

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