Photonic and Electronic Device Applications *via* Soft Lithography

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Soft lithography is a versatile technology for fabricating structures using elastomeric polymers, which has outstanding advantages such as simple large-area process and mass production at low cost in comparison with conventional lithography methods (i.e., photolithography and electron-beam lithography). The resolution of soft lithography has been dramatically enhanced by the research efforts ranging from material design to fabrication techniques, and currently sub-100 nm feature size can be achieved via simple routes without external pressure assistance. Considering that a variety of micro- and nano-structures are essentially used in modern photonic and electronic devices, soft lithography is expected to provide enormous synergetic benefits in processing through the merging with the device fabrication. In addition, new functionalities originating from elastomeric materials such as flexibility and stretchability can be easily introduced for further applications.

In this seminar, recent studies based on soft lithography for various device applications will be mainly discussed, including the patterning of polymeric stencils (i.e., membranes), electronic circuits, and optical gratings. Polydimethylsiloxane (PDMS) and polyurethane acrylate (PUA) were mainly used for polymer patterning owing to their low moduli and surface energies enabling conformal contact and easy release, and the high light transmissivity of PUA (~90 %, in range 300 to 1100 nm) is also notable for a wide range of photonic device applications. Based on the current stage, the future prospects of soft lithography and its applications also will be discussed in this seminar.