

Molecular Transfer Printing Using Silicon Membrane for the Fabrication of Large Area Chemical Patterns on Highly Flexible Substrates

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Abstract: By transferring functionalized homopolymer inks that preferentially segregated into the nanodomains of phase-separated block copolymer films to a replica substrate, molecular transfer printing (MTP) stands as a promising technique to create and replicate chemically patterned surfaces.¹ Similar to the other contact lithographic techniques, one key of MTP is the conformal contact between the master block copolymer film and the replica substrate. Here, we present a method that combining ultrathin silicon membrane and MTP to achieve the conformal contact and, furthermore, to fabricate chemical patterns on a flexible substrate. The silicon membranes are prepared by etching away the buried oxide (BOX) layer in silicon on insulator (SOI) wafer. Master block copolymer films containing inks are either self-assembled on homogeneous non-preferential wetting substrate or directed assembled on lithographically defined prepattern. Silicon membrane is gently transferred to the master block copolymer film and close contacts with the film. After MTP process, the silicon membrane is flipped over and conformal bonds to a substrate with high curvature. Uniform chemical patterns were observed on whole area of the silicon membrane.

¹ S. X. Ji, C. C. Liu, G. L. Liu et al., "Molecular Transfer Printing Using Block Copolymers," *Acs Nano* **4** (2), 599-609 (2010).

