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Transfer durability and fidelity of hard release-agent-free replica mold by repetition of Ultraviolet nanoimprint lithography

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Abstract

Ultraviolet nanoimprint lithography provides a high-throughput and cost-effective method to fabricate nanopatterns. However, the master mold deteriorates owing to the adhesion of resin and the occurrence of defects. Prompted by the need to prevent deterioration of the master mold, we developed a new release-agent-free replica mold with high toughness and high hardness. We evaluated the durability, error rate, and fidelity of the transfer patterns of the newly developed release-agent-free replica molds of hard pillar- and hole-shaped patterns. As a result, the developed replica mold with pillar-shaped patterns exposed to UV radiation at 50 J/cm^2 has the best release properties, and the replica mold with hole-shaped patterns can transfer up to 7000 imprint times under the same conditions.

Keywords: Ultraviolet nanoimprint lithography (UV-NIL), Replica mold, Release-agent-free, Contact angle