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Fabrication of micro/nanoscale hierarchical structures and its application

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Key Words : Micro/nanoscale hierarchical structures (/), 2-step capillary molding (2)

Abstract

A simple method is presented for fabricating micro/nanoscale combined hierarchical structures using a two-step UV-assisted capillary molding technique. This lithographic method consists of two steps: (i) fabrication of partially cured polymer microstructures using a PDMS mold and (ii) subsequent nanofabrication using a high-resolution polyurethane acrylate (PUA) mold on top of the pre-formed microstructures. Using this technique, various micro/nano hierarchical structures were fabricated with minimum resolution down to 70 nm over a large area with very good reproducibility.

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vapor-induced phase separation,
crystallization of polyethylene

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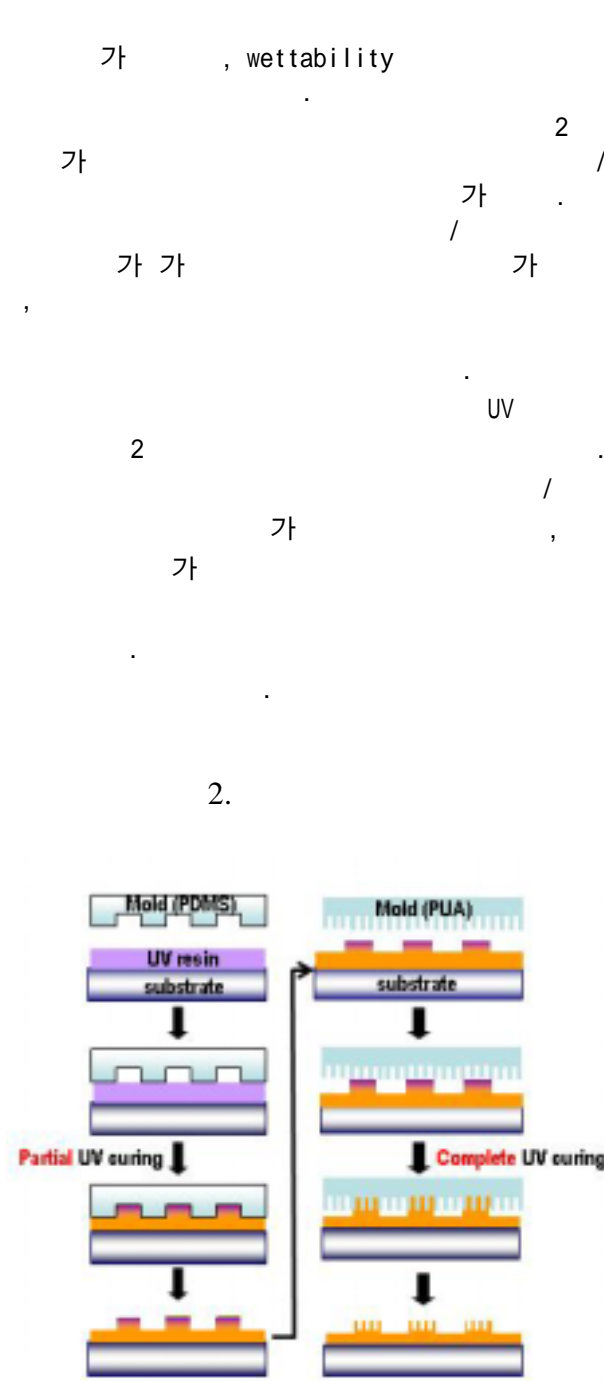


Fig. 1 A schematic diagram of the two-step UV-assisted capillary molding process.

UV
 PDMS
 UV
 10

가 PUA
 2 UV
 PDMS
 (1.8 MPa)
 가 100 nm
 가
 PUA
 가 50 μm
 PDMS (tensile modulus of 40 MPa)
 가 PUA
 가
 UV
 2
 가
 가
 2.2 SEM
 (SEM, XL30FEG)
 3.
 , 70
 (nanolines) 150
 (nanopillars)

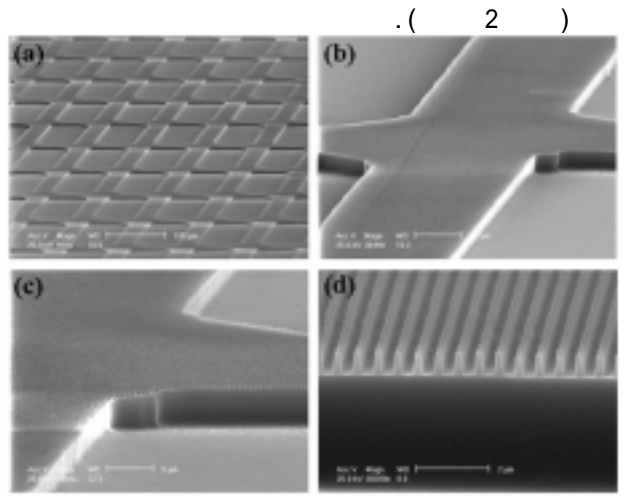


Fig. 2 (a) A SEM image of micro/nanoscale hierarchical structure and (b-d) its enlarged images.

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 UV
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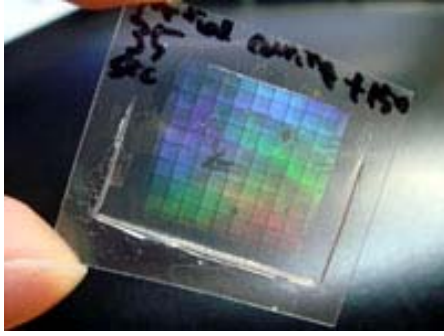


Fig. 3 A photograph demonstrating the large-area fabrication of micro/nanoscale hierarchical structures ($\sim 2 \times 2 \text{ cm}^2$).

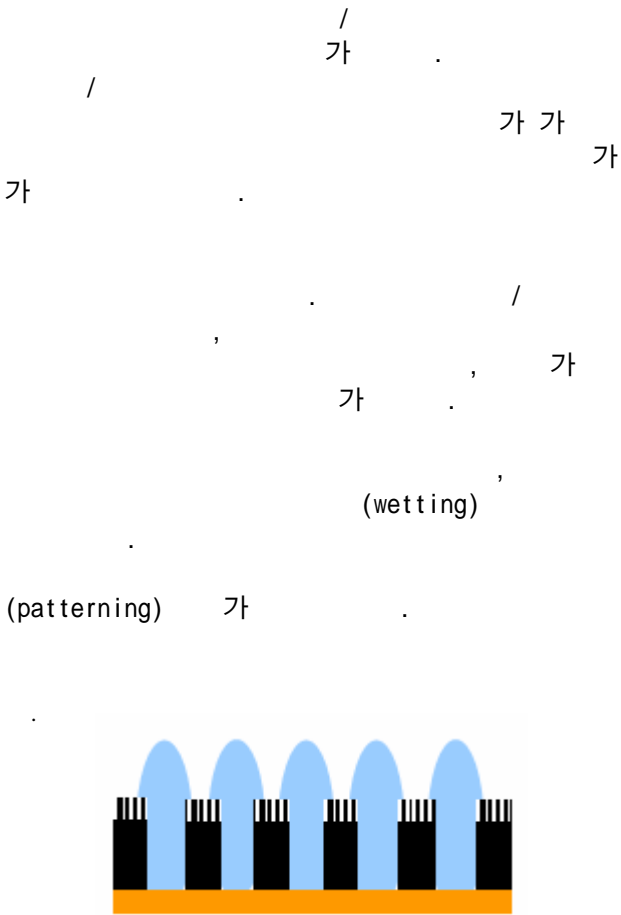


Fig. 4 An example of micro/nanoscale hierarchical structures.

- (wettability) 가
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- (wetting) 가
- (patterning) 가
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UV 2