Polyimide hierarchical structures via imprinting and dewetting

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A patterned polyimide with hierarchical structure is obtained by imprinting with the assistance of a residual solvent.[1] The effects of the wetting behaviors of the poly-amic acid (PAA) solution coated on surface examined and the formation of hierarchical patterns without residual layers is demonstrated. The results indicate that the hierarchical structures are formed due to the dewetting phenomena caused by surface tension.[2] During imprinting, PDMS with a low surface energy makes the PAA solution flow away from its surface and exposing the contact area due to dewetting. Self-organized hierarchical structures are also obtained from this process due to effective dewetting. A hierarchical structure could be seen in Fig. 1, where the PAA solution exhibited a dewetting effect on the PDMS mold, which means that the formation of the smaller circle at the center of four octagonal pads was due to dewetting behavior. The present study provides a new approach for fabricating patterns without residual layers and the consequent preparation of hierarchical structures, which is considered to be impossible using the lithographic technique.

Keywords: dewetting; soft lithography; solvent-assisted imprint; poly-amic acid (PAA)

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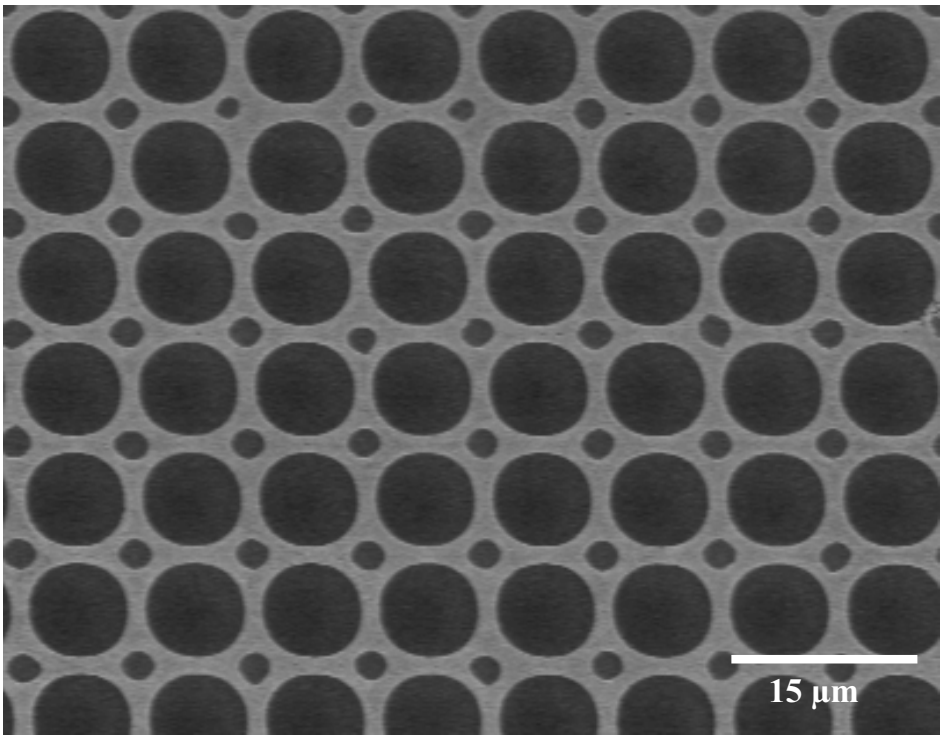

Fig. 1: Scanning electron microscopy image of polyimide patterns formed by imprint.