

# Fabrication of the flexible metallic master using LTIL process for roll nanoimprint lithography

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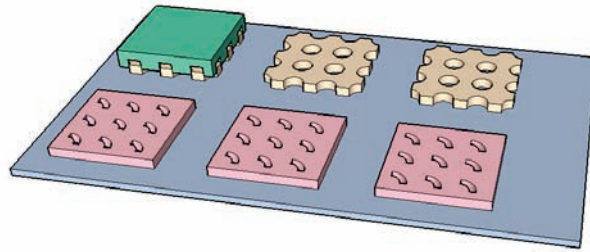
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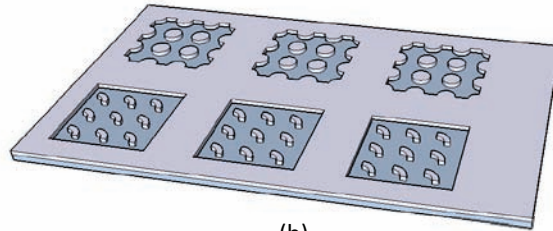
NIL can achieve the mass production of the nano patterns, and roll NIL process can make improve this advantage of NIL technology. However, the fabrication for the small feature sized nano pattern is very difficult on the curved surface as like cylindrical substrate. To overcome this difficulty, the various fabrication processes for the roll master is developing. More efficient method in these processes is the flexible master, what can rap the core cylinder. Eventually, this flexible master way is made usually PDMS, which has a limitation as like mine width. In this paper, these problems, which are the curved surface and linewidth limitation, are solved using metallic flexible master.

The O<sub>2</sub> plasma treatment is executed on aluminum sheet, and the glass primer for PUA is spin coated 3000rpm for 30sec. after baked on 150°C hotplate for 10min, the pattern is transferred from diluted PUA (1:10 in PMGEA) coated donor substrate to prepared aluminum substrate by LTIL process. Liquid Transfer Imprint Lithography (LTIL) can make the perfectly zero residual layers, because this process is similar process. This LTIL process is repeatedly executed on same surface with various nano patterns. And then, aluminum is deposited on this PUA pattern to execute the lift-off process in TMAH 25% solution. For the rapping able on the metal cylinder, the soft PDMS is chemically bonded on the opposite surface of the aluminum nano pattern. The PDMS-glass adhesion promoter is gently rubbed after O<sub>2</sub> plasma treatment. PDMS solution is poured on this surface, and cured in 70°C oven for 2 hours.

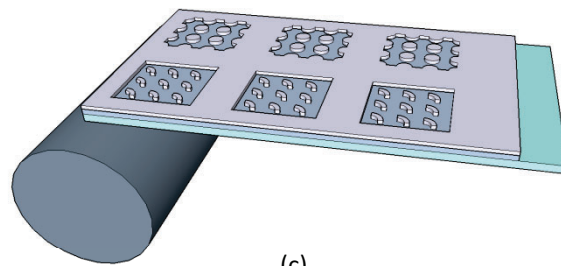
Below images are shown the fabrication process and the transferred nano pattern on the aluminum sheet.



(a)

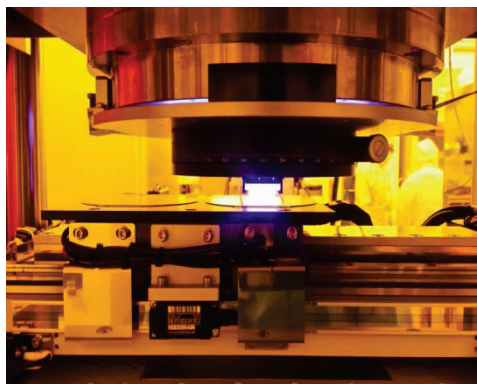


(b)

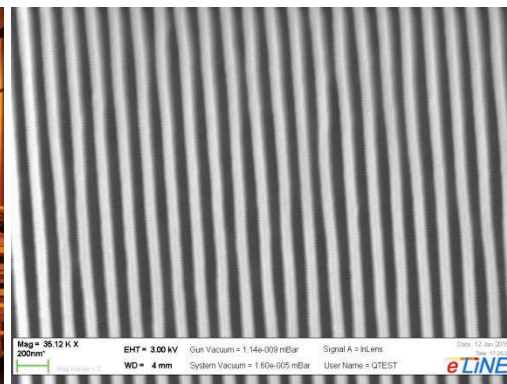


(c)

*Figure 1 : Fabrication process of the flexible metallic master for the roll nanoimprint lithography: (a) repeated LTIL process to transfer nano pattern without residual layer (b) Aluminum lift-off process to make the flexible metallic master (c) Rapped flexible metallic master*



(a)



(b)

*Figure 2: Liquid Transfer Imprint Lithography process: (a) the LTIL machine image (b) transferred 70nm line pattern on the aluminum sheet*