Digital patterning of slippery surfaces for liquid manipulation

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The understanding of the relationship between liquid manipulation and interfaces has garnered significant attention due to its wide and potential applications in various fields such as chemical and biomedical analysis, environmental protection, industry, and daily life. The development of materials with the ability to manipulate liquid interfaces has led to diverse and intriguing applications [1]. Among them, there has been considerable interest and research in slippery surfaces that exhibit a slippery property towards various liquids and droplets. However, the manipulation of liquids or droplets requires spatially confined patterned slippery surfaces, which necessitates further research. Existing methods for fabricating patterned slippery surfaces have been limited by their complexity and low design freedom in pattering.

To address these limitations, this study proposes a simple method for fabricating patterned slippery surfaces with enhanced design flexibility using digital patterning. The patterned slippery surfaces produced using our proposed method exhibit excellent transparency (Figure 1) and demonstrate remarkable slipperiness very low sliding angles when in contact with various liquids. Through this approach, we confirm the effective manipulation of liquids using the fabricated patterned slippery surfaces. In addition, we can make the micro-patterned slippery surface by using nanoimprint lithography and it is possible to continuous production by using the roll-to-roll system. Due to their outstanding characteristics in liquid manipulation, droplet transport, and transparency, these patterned slippery surfaces are expected to find diverse applications in fields such as flexible transparent electrodes, water harvesting, and microfluidics in the future.

Acknowledgement: This work was supported by the technology innovation program (20018235, Development of inline nanoimprinter for nano photonic device) funded by the ministry of trade, industry and energy(MOTIE, Korea). Also, This work has supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MSIT)(NRF-2022R1C1C1003966 and RS-2023-00238462).

Reference:

[1] Zuo, Yinxiu, et al.; “Micro-/Nanostructured interface for liquid manipulation and its applications” Small 2020 16,(9) 1903849.

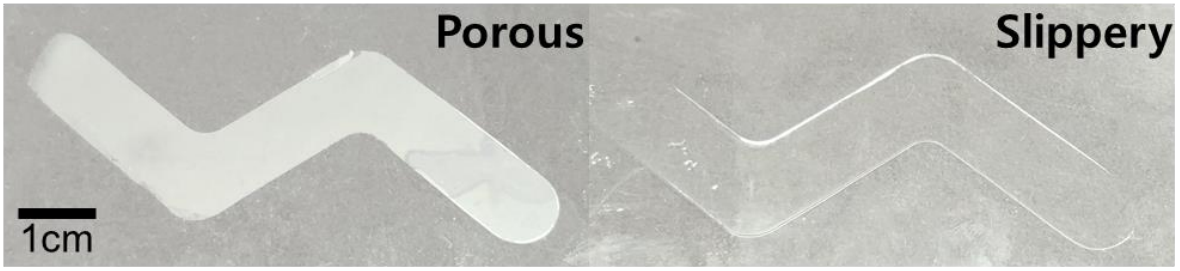

Figure 1. Digital patterning porous surface and slippery surface.