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Conference Paper · December 2018

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REPLICATION OF THE SURFACE WETTABILITY OF PLANT LEAVES WITH DIFFERENT SURFACE MORPHOLOGIES USING SOFT LITHOGRAPHY

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ABSTRACT

Naturally occurring surfaces such as in most aquatic plants display interesting surface wetting properties such as superhydrophobicity, superoleophobicity and directional wettability. These phenomena arise from the micro/nano structures present on these surfaces complimented by their surface chemistry. The replications of such surface structures are highly pursued due to their potential in applications such as self-cleaning (Lotus effect), microfluidic devices and antifouling surfaces. Soft lithography is a technique that has been used to replicate micro/nano structures with varying degrees of success. Nevertheless, in the context of natural surfaces the technique has been mostly limited to the replication of the lotus leaf structure. Therefore, a systematic investigation could be fruitful since it has the potential to be scaled up to replicate different surface structures as well as large-area patterning. In this study, the feasibility of soft lithography technique on natural leaf surfaces were investigated using five plant species with different surface morphologies. The negatives of these primary molds were replicated using polydimethylsiloxane (PDMS) and the final positive replica, was successfully replicated from PDMS while using hydroxypropyl methylcellulose (HPMC) as an anti-stick layer. The structures were characterized based on SEM images and contact angle measurements. Additionally, the effect of HPMC and degassing were also investigated. The technique can easily be extended to broader applications in other areas that require micro/nanostructured surfaces such as anti-reflection coatings, chemical sensors and anti-microbial surfaces.

Keywords: micro-structures, soft-lithography, PDMS molding, lotus effect, surface fabrication, bio-mimicry