課題番号　：F-18-UT-0091
利用形態　：機器利用
利用課題名（日本語）　：
Program Title (English)　：Electric instability of Cassie droplets on superlyophobic surfaces
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キーワード／Keyword　：リソグラフィ・露光・描画装置，Superlyophobic surface, Cassie state, Electrowetting

1. 概要（Summary）

The liquid−air interface of Cassie droplets on superhydrophobic/superlyophobic surfaces has been directly captured with a high-precision laser displacement meter. The measured profile of the interface shape and the critical voltage with which the Cassie-to-Wenzel transition occurs are compared against those from numerical simulations of the electric field coupled with the interface shape. Under the applied voltage, the collapsing behavior of water, glycerol, and hexadecane droplets on SU-8, CYTOP, and overhanging Si/SiO2 pillars has been uniquely identified depending on the liquid properties, the pillar geometry, and the pillar material.

2. 実験（Experimental）

【利用した主な装置】
高速大面積電子線描画装置，高速シリコン深掘りエッチング装置，汎用 ICP エッチング装置
【実験方法】

The fabrication of the present super-lyophobic surface includes the equipments of EB-lithography to pattern the mask for pillared surface, CE-300I for CHF_4 plasma etching of SiO_2, and the MUC-21 for deep etching of pillar structures. The fabrication process is followed by oxidation of Si and coating of hydrophobic layer.

3. 結果と考察（Results and Discussion）

It is shown that, with increasing voltage, the contact angle at the three-phase contact line approaches the maximum advancing angle along the pillar sidewalls, above which the depinning from the pillar edge leads to a slide-down motion (Fig. 1). The slide-down instability is dominant over the pull-in instability both on dielectric pillars and conductive overhanging pillars. It is indicated that the collapsing behavior on the present overhanging pillars is closely related to contact angle saturation in electrowetting and stick-slip motion of the contact line.

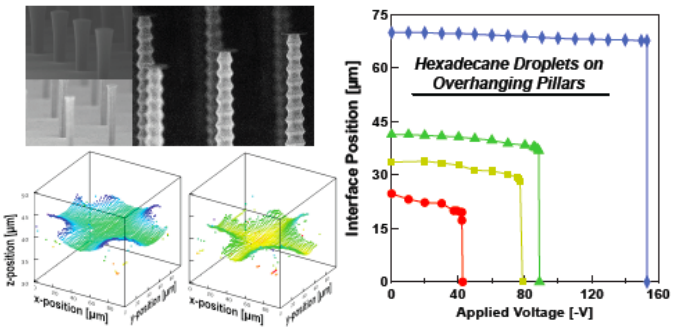

Fig. 1: MEMS-based superhydrophobic/super-lyophobic surfaces and measured liquid-air interface.

4. その他・特記事項（Others）

なし

5. 論文・学会発表（Publication/Presentation）

(1) Chen, Y.-C., Suzuki, Y., Morimoto, K., “Electrowetting-Dominated Instability of Cassie Droplets on Superlyophobic Pillared Surfaces,” Langmuir, Vol. 35(6), pp. 2013-2022 (2019).

6. 関連特許（Patent）

なし