Investigation of surfaces micropatterned by interference lithography for reversible electrowetting

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Electrowetting consists in the tuning of a surface's wettability by application ofelectrical pulses. This technique already finds applications in miniaturised focusable lenses or new types of digital displays.[1] In a typical electrowetting device, a fairly high voltage (~ 50-100 V) is applied across a thin insulator (~ 1 mm), which forces the contact angle of a liquid on the insulator to drop. Despite the great progress made in the field in the last decade, new types of surface are still needed to achieve electrowetting at lower voltages. Microstructured surfaces are one possible answer to this problem, as they can provide enhanced wettability properties compared to flat surfaces.

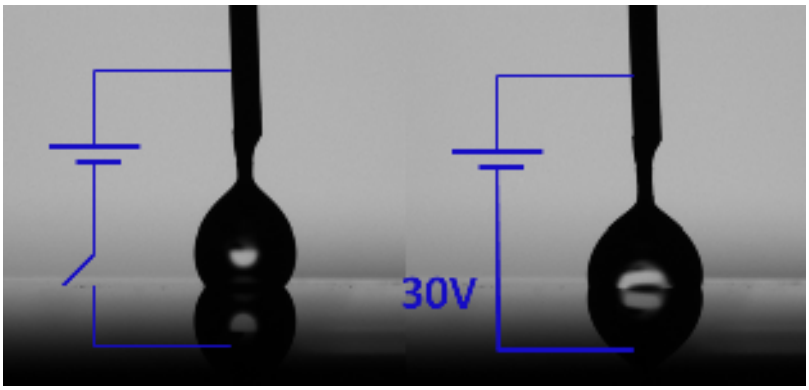

Fig. 1 Electrowetting of a micropatterned surface by water.

The research presented here will describe the use of micropatterned surfaces prepared by interference lithography. On silicon (100) covered with an antireflective coating, lines and pillars were prepared with half-pitch values all inferior to 1 mm. To further increase the hydrophobicity of these surfaces, they were coated with a thin layer of a low-K insulator (PDMS) by plasma-enhanced chemical vapour deposition. Surfaces thus prepared display water contact angles as high as 145°.
Initial results showed electrowetting could be achieved with voltages as low as 20 V (Fig. 1), while breakdown did not occur below 100 V. Partial reversibility has also been demonstrated. Besides, line-patterned surfaces showed anisotropic electrowetting, mainly parallel to the long axis of the patterns.
Further studies are being carried out on the long-term stability of the surfaces and the decrease of contact angle hysteresis.

References:
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