

Supplementary Information

Condensed dewdrops self-ejecting on sprayable superhydrophobic CNT/SiO₂ composite coating

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Table of Contents

Materials and Methods

Supplementary Figures S1-S4

Supplementary Video S1-S2

Materials and Methods

Materials. Hydroxylated carbon nano-tube (HCNT) powders were referred by Chengdu Organic Chemicals Co. Ltd.. 1H, 1H, 2H, 2H-perfluorodecyltriethoxysilane (PFDTES) were purchased from Sikang New Material Co., Ltd. Absolute ethyl alcohol (EtOH), deionized water, ammonium hydroxide (28 %), tetraethyl orthosilicate (TEOS), and other chemical reagents were purchased from Sinopharm Chemical Reagent Co., Ltd.

Methods. Hydroxylated carbon nano-tube-SiO₂ nano-particles (HCNT-SNP) composite paint were fabricated by a self-assembly process using for growth of SNP on a HCNT in a mixture solution of EtOH-NH₃·H₂O-H₂O. After 60 min, the HCNT-SNP nano-tubes were modified by PFDTES for superhydrophobicity. The typical composition for the preparation of HCNT-SNP superhydrophobic paint was as follows: 80mL of EtOH, 8mL of deionized water and 4mL of ammonium hydroxide were mixed in a 100mL terrarium. Subsequently, 0.18g of HCNT powders were added in the mixture solution. After ultrasonic for 60min, 0.6mL of TEOS were injected under rapid stirring condition. Continuous stirring for 60 min, 0.6 mL of PFDTES were dropped for hydrophobization. The HCNT-SNP superhydrophobic paint were finally obtained after continuous stirring for 24 h. Correspondingly, fluorinated HCNT (F-HCNT) paint were fabricated by the same process without added TEOS. For acquisition of superhydrophobic surfaces, a spray painting apparatus equipped with S-130 airbrush (U-STAR, nozzle diameter of 0.3 mm) and U-601G gas compressor (U-STAR, 20 psi) was used to spray above paint on cleanly substrate. The airbrush was moved (about 0.1 m·s⁻¹) maintaining about 10 cm distance and according to an S-style spray route from top to bottom. This process could control the thickness (5–10 μ m) of the coating by spray-steps.

Supplementary Figures

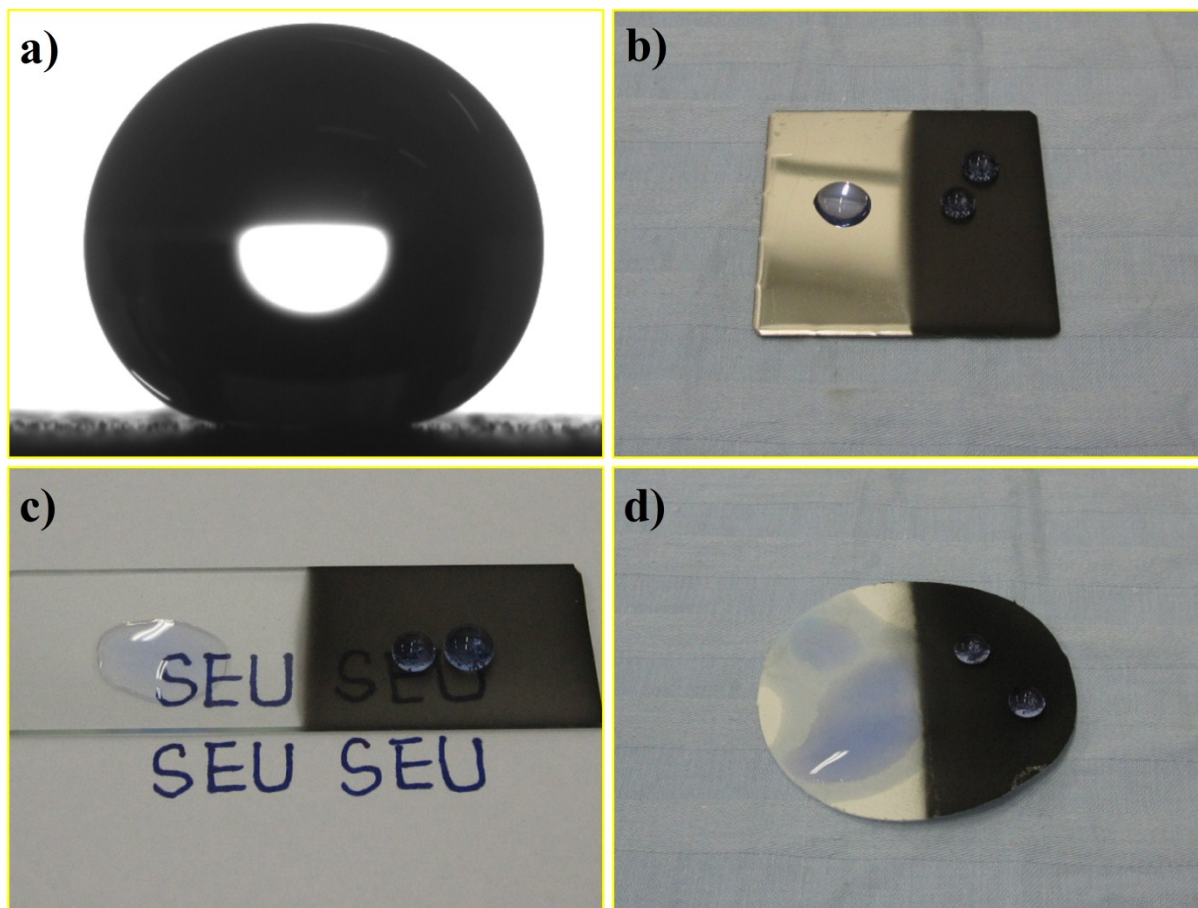


Fig. S1 a) A 5 μ L water drop deposited on the HCNT-SNP surface possess a static contact angle of 163.2° (Then, the roll-off angle is 4.2°). Optical images of water droplet dyed by methyl blue on the HCNT-SNP surfaces with **b)** stainless steel, **c)** glass and **d)** filter paper substrates.

Supplementary Figures

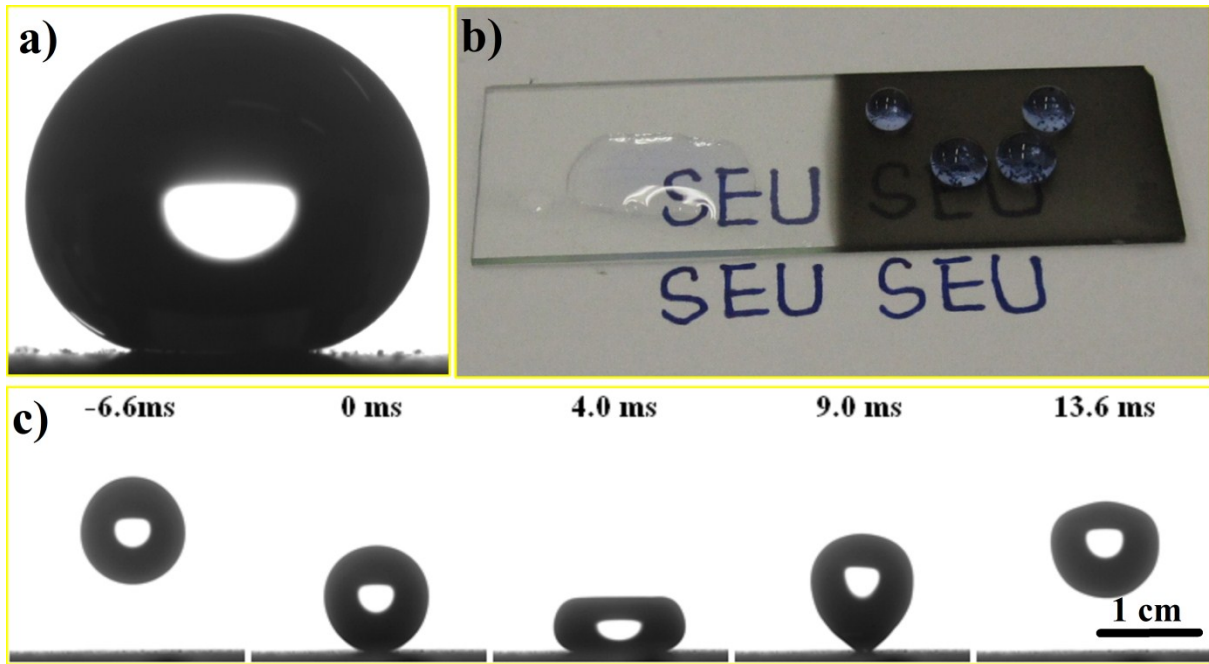


Fig. S2 a) A 5 μL water drop deposited on the F-HCNT surface possess a static contact angle of 161.6° (Then, the roll-off angle is 3.9°). **b)** Optical images of water droplet dyed by methyl blue on the F-HCNT surfaces with glass substrates.

d) Water droplet bouncing test on F-HCNT coating.

Supplementary Figures

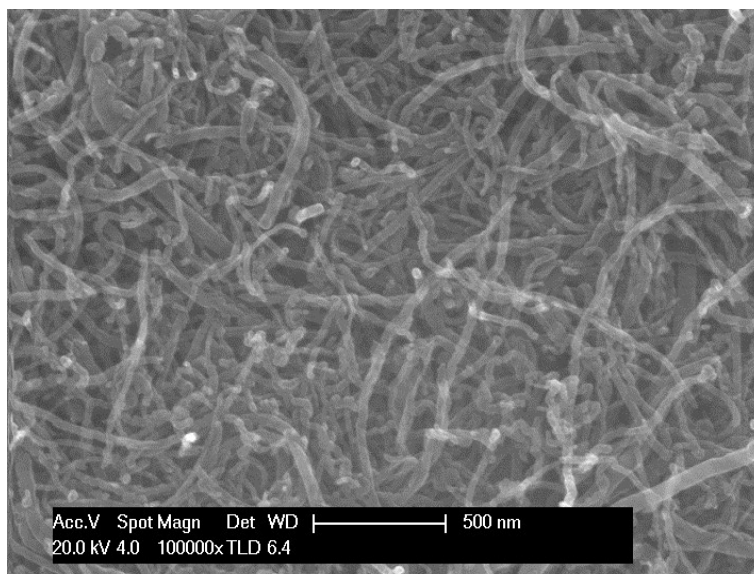


Fig. S3 FESEM image of F-HCNT coating by one-step spray.

Supplementary Figures

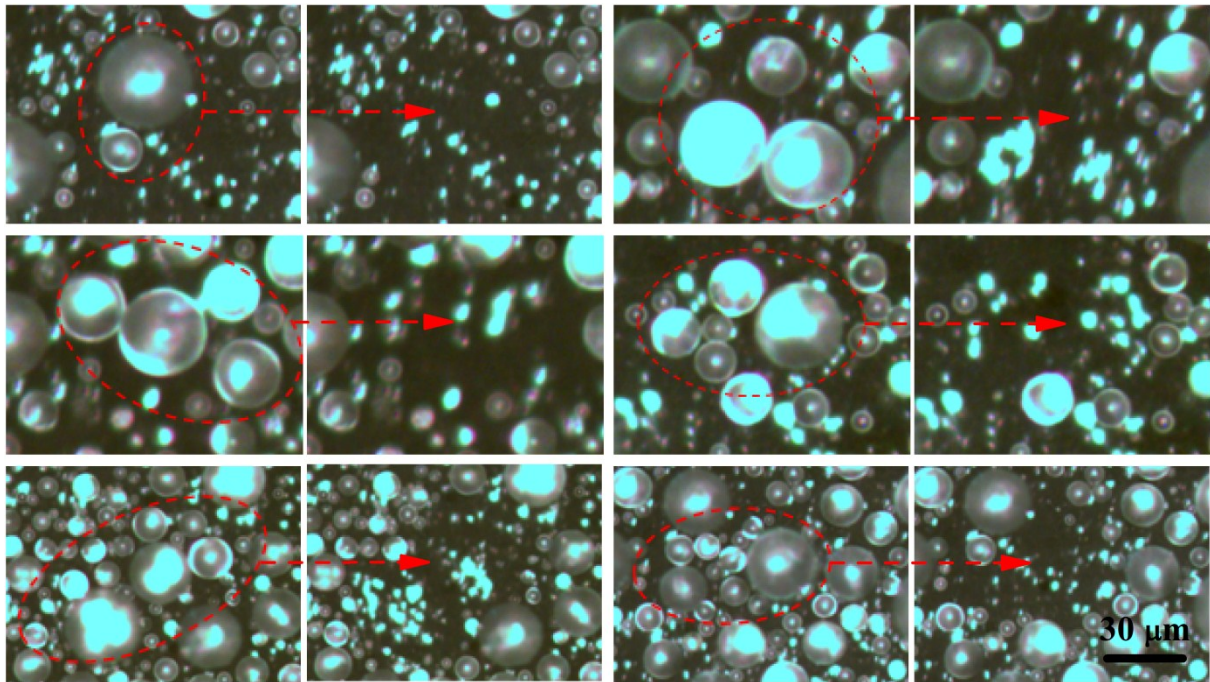


Fig. S4 Time-lapse images captured the spontaneous droplet jumping process with two or more dewdrops on the horizontal superhydrophobic HCNT-SNP composite coating.

Supplementary Videos

Video S1-S2 The CDSE effects were captured on superhydrophobic HCNT-SNP composite coatings placed vertically by high speed camera at top- and side-view during the condensing process.