Electronic Supplementary Material (ESI) for Soft Matter.
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Supplementary Information for

Soot liquid marbles

Xiaoguang Li*, Haixiao Shi, Yiqi Wang, Hanming Wang, Junchao Huang, and Mei Duan

School of Physics Science and Technology, Shaanxi Key Laboratory of Condensed Matter Structures and Properties, Northwestern Polytechnical University, Xi'an, 710129, China

E-mail: lixiaoguang@nwpu.edu.cn

Details in light decomposition experiment

A 0.1 M $AgNO_3$ solution was prepared by dissolving $AgNO_3$ in running water in which traces of chloride ions existed, hence forming traces of AgCl. This kind of solution was found suitable for light decomposition experiments, as the color change speed was moderate. Concave glasses coated with stable superhydrophobic coatings[3a] were employed to support naked water drop and various liquid puddles of ~1.0 mL. For each kind of puddle, five samples were produced and liquid was extracted from one of them at set time intervals and sealed in a tube for photography.

Characterizations

Morphologies of soot, black carbon, and CNT were observed by SEM (Verios G4, FEI Co., USA). Profiles and morphologies of soot liquid marbles were observed by Three-Dimensional Digital Microscope (RH-2000, Hirox Co., Japan) and digital camera (D610, Nikon Co., Japan).

Modification of CNT powder

The purchased CNT powder was found to be hydrophilic and not able to generate liquid marbles. To address this issue, surface modification was conducted with hexamethyldisilazane (HMDS). In brief, a plate of HMDS (~2.0 mL) was placed together with the powder in a sealed container at room temperature for 40 min. During this period, the powder was stirred once using a spoon to facilitate a sufficient

modification. The modified CNT powder coating was superhydrophobic and can easily generate a liquid marble by the rolling-on-powder-bed method.

Uncertainty calculation

The resistance was a direct measurement quantity in this study, which was measured with at least five examples. The error bar was determined by the uncertainty calculation principle, with component A considered and B ignored:

$$u(x) = u_A(x) = t_p \sqrt{\frac{1}{n(n-1)} \sum_{i=1}^{n} (x_i - \bar{x})^2}$$

Table 1 t_p as a function of repetition n

n-1	1	2	3	4	5	6	7	8	9	10	15	20	30	40	∞
t_p	1.84	1.32	1.20	1.14	1.11	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1

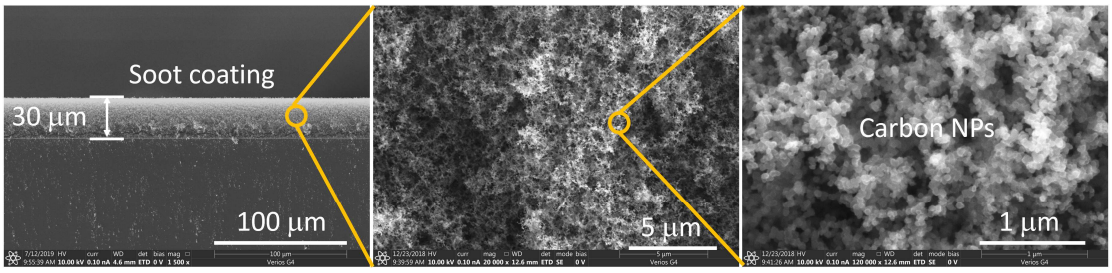

Fig. S1. SEM images of a soot coating produced by ~5 s incomplete combustion, with different magnifications.

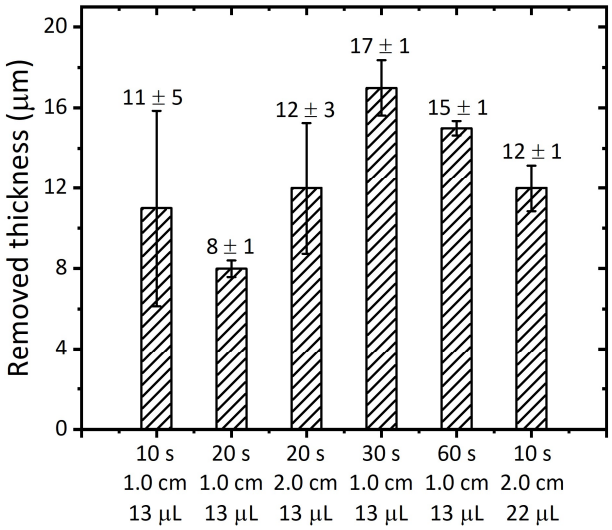

Fig. S2. Removed coating thickness by first drop impingement versus experimental parameters, including soot deposition time, drop falling height, and drop volume.

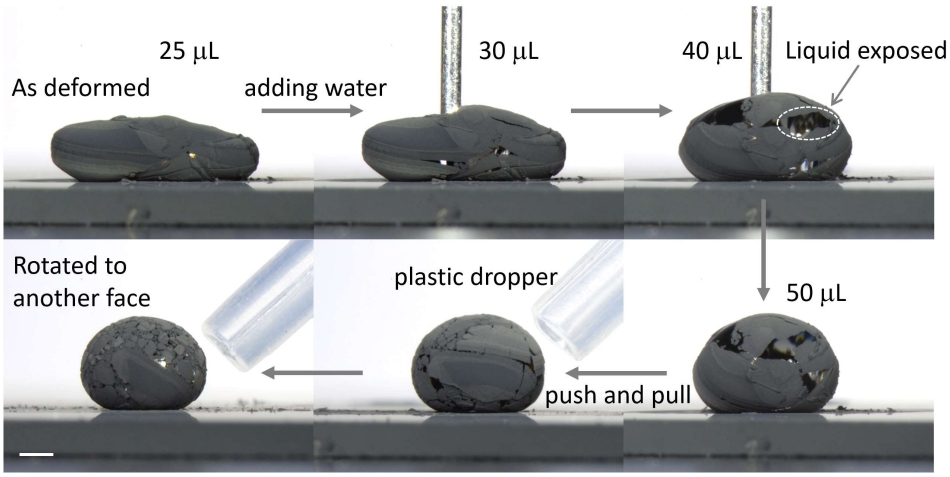

Fig. S3. Illustration of a normally-shaped liquid marble production by adding liquid into a deformed marble with a large spanwise size. Bar represents 1 mm.

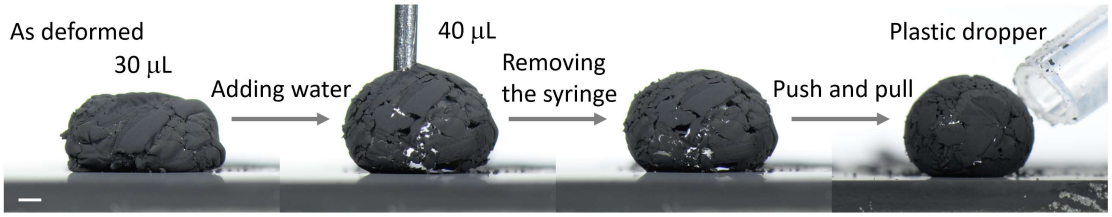

Fig. S4. Illustration of a normally-shaped liquid marble production by adding liquid into a deformed marble with a rectangular shape. Bar represents 1 mm.

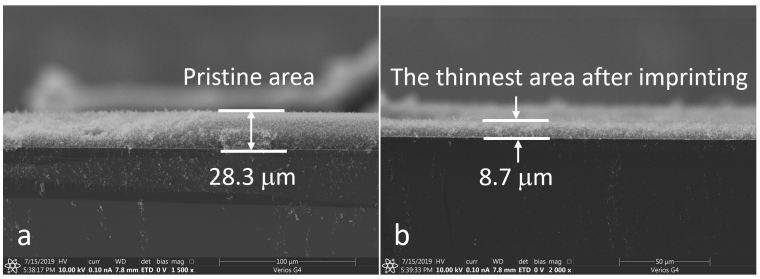

Fig. S5. SEM images of the pristine (a) and thinnest (b) areas of a soot coating after squeezing a droplet. The thickness gap was ~20 μm, which equaled the removed coating thickness. Squeezing force ~5.0 mN and droplet volume ~20 μL.

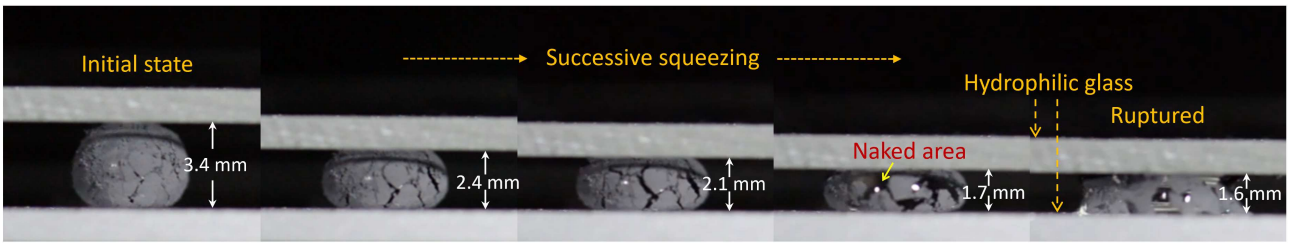

Fig. S6. Sequenced images of an imprinting-derived soot liquid marble (20 μL) during compression with two naked glass slides. As shown, naked liquid areas increased gradually before the final rupture.

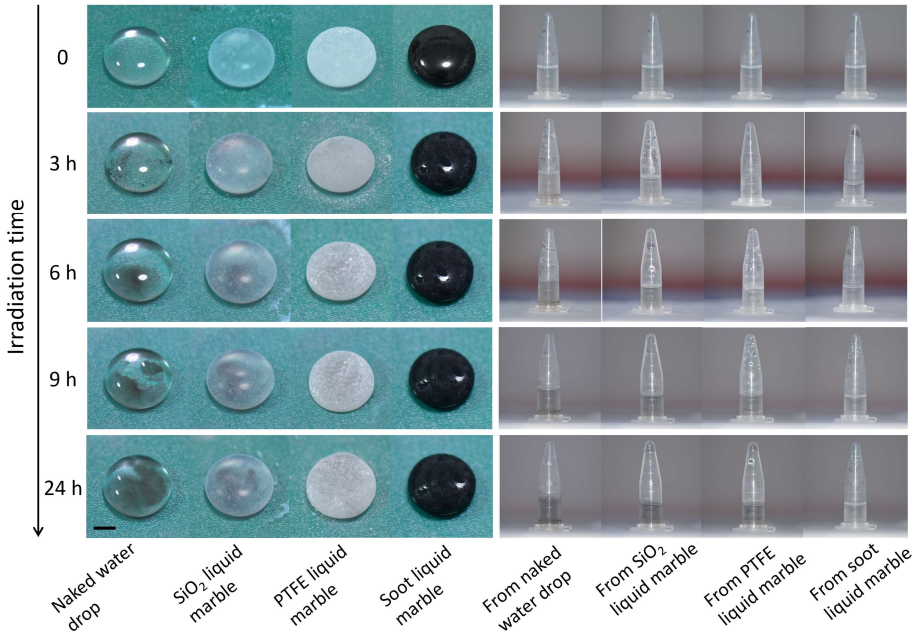

Fig. S7. Appearance evolutions of liquid puddles (~1.0 mL) and their liquids during the whole process of light irradiation. Bar represents 5 mm.