Electronic Supporting Information

Field Induced Anomalous Spreading, Oscillation, Ejection, Spinning, and Breaking of Oil Droplets on Strongly Slipping Water Surface

Sunny Kumar,[a] Bhaskarjyoti Sarma,[c] Ahsok Kumar Dasmahapatra,[a,b] , Amaresh Dalal,[c] Dipankar Narayan Basu,[c] and Dipankar Bandyopadhyay*[a,b]

[a]*Department of Chemical Engineering, Indian Institute of Technology Guwahati, India*

[b]*Centre for Nanotechnology, Indian Institute of Technology Guwahati, India*

[c]*Department of Mechanical Engineering, Indian Institute of Technology Guwahati, India*

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Corresponding Author: dipban@iitg.ernet.in

Table SI: Physical properties of the experimental materials and fluid[1-7]

Properties		Water	Teflon	Silicon oil	Oleic acid	Hexadecane
Dielectric constant	ε	80	2	2.5	2.5	2.1
Surface tension (mN/m)	γ	72	-	21	42	27
Interfacial tension (mN/m)		-	-	24	64	52
Density (kg/m^3)	ρ	1000	-	971	895	770
Viscosity (Pa s)	μ	0.001	-	0.33	0.027	0.003
Conductivity (µS/m)	σ	5.6	-	0.8×10^{-6}	10^{-6}	10^{-6}

Supporting Video 1. Expansion: The video shows the expansion or spreading of the oil droplet for the EWOL setup, as shown in Figure 1a. Here a 1 µl hexadecane droplet expanded on the water surface when we abruptly applied 500 V.

Supporting Video 2. Oscillation: The video shows the oscillation of an oil droplet on the EWOL setup shown in Figure 1b. Here a 1 µl of hexadecane droplet expanded and then oscillated on the water surface when we abruptly applied 550 V.

Supporting Video 3. Ejection: The video corresponds to the EWOL experimental setup shown in Figure 1c in which 1 µl of hexadecane droplet ejected out of the electric field when we abruptly applied the 800 V.

Supporting Video 4. Expansion, Oscillation and Ejection of droplet: The video shows simultaneous expansion, oscillation, and ejection of the oil droplet in the EWOL setup when the applied potential was progressively increased at a rate of 8 V/s.

Supporting Video 5. Clockwise and Anti-Clockwise Rotation: The video corresponds to the setup shown in the Figure 1d, where the EWOL experiments were conducted on a permanent magnet. The video shows clockwise and anticlockwise rotational motions with the change in the direction of the magnet.

Supporting Video 6. Droplet Breaking: The video corresponds to the EWOL experiments on a magnet, as schematically shown in the Figure 1d. In this situation, the spreading due to the rotation of the droplet and the shear at the oil-water interface led to the droplet breakup.

References

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