Supporting Information for

Hierarchical nanotexturing enables acoustofluidics on slippery yet sticky, flexible surfaces

Ran Tao,[1,3] Glen McHale,[1] Julien Reboud,[2] Jonathan M. Cooper,[2] Hamdi Torun,[1] JingTing Luo,[3] Jikui Luo,[4] Xin Yang,[5] Jian Zhou,[6] Pep Canyelles-Pericas,[7] Qiang Wu,[1] and Yongqing Fu[1]*

1. Faculty of Engineering and Environment, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK

2. Division of Biomedical Engineering, James Watt School of Engineering, University of Glasgow, Glasgow, G12 8LT, UK

3. Shenzhen Key Laboratory of Advanced Thin Films and Applications, College of Physics and Energy, Shenzhen University, 518060, Shenzhen, China

4. College of Information Science & Electronic Engineering, Zhejiang University, Hangzhou 310027, China

5. Department of Electrical and Electronic Engineering, School of Engineering, Cardiff University, UK CF24 3AA

6. College of Mechanical and Vehicle Engineering, Hunan University, Changsha 410082, P. R. China

7. Department of Integrated Devices and Systems, University of Twente, Enschede 7522 NB, The Netherlands

Corresponding author: Prof. Richard Yongqing Fu, E-mail: richard.fu@northumbria.ac.uk

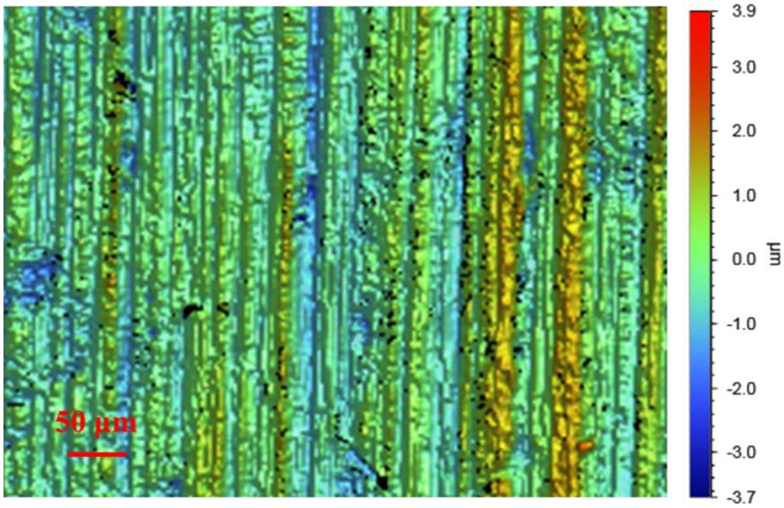

Figure S1. Surface morphology of 600 µm thick Al substrate measured using interferometer. The surface of the substrate comprises of groove patterns, where the average width between two grooves is about 24.9 ± 7.8 µm.

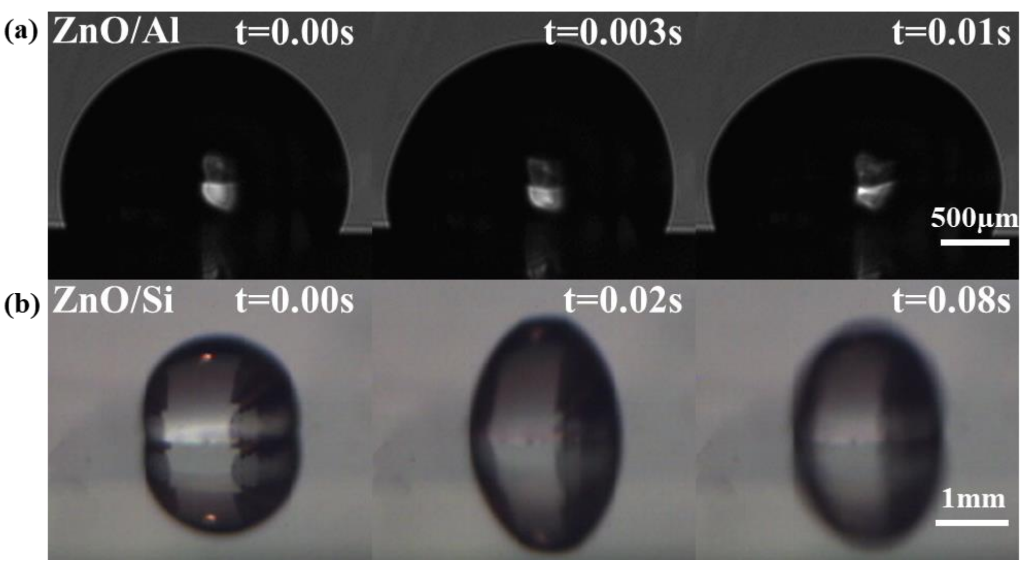

Figure S2. Deformation of 1 μL droplet during the movement. Droplet driven by acoustic waves based on (**a**) ZnO/Al with actuation frequency of 9.56 MHz and an input power of 0.7 W, and (**b**) ZnO/Si with actuation frequency of 14.5 MHz and an input power of 2.5 W.

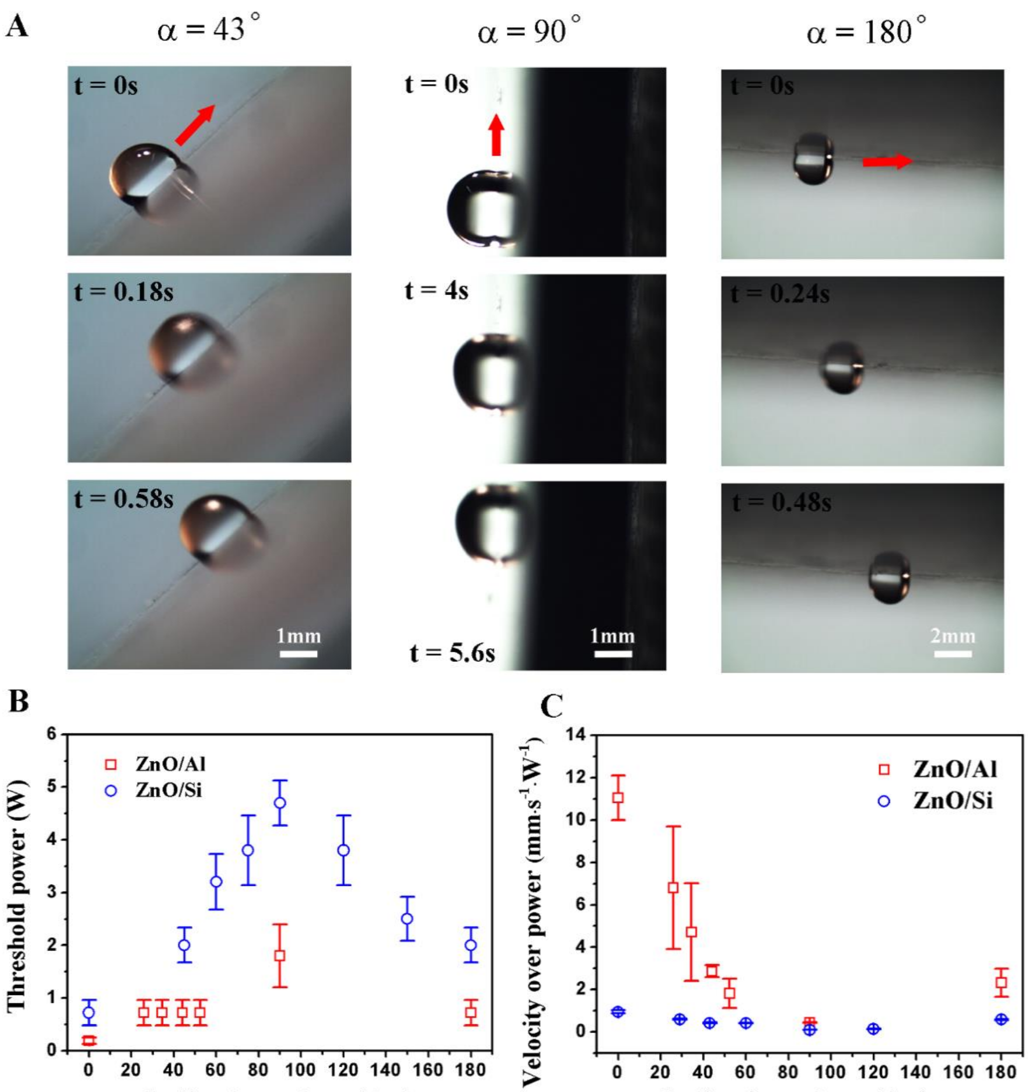

Figure S3. Droplets moving on various tilted flat surfaces. (**A**) 1 μL water droplets moving on inclined surface with tilted angle of 16º, 43º, 90º and 180º driven by surface acoustic wave devices with the threshold power. (**B**) Threshold power to initiate movement and (**C**) average velocity (averaged over time) divided by power for 1 μL water droplets on ZnO/Al and ZnO/Si surface acoustic wave devices with tilting varying from 0º to 180º.

Table S1. Data of contact angle hysteresis measurements. Static contact angle, advancing contact angle, receding contact angle and contact angle hysteresis for four different surfaces.

Surface type	θ_s	θ_{adv}	θ_{rec}	$\Delta\theta = \theta_{adv} - \theta_{rec}$
ZnO/Al	98º±10º	111º±1º	49º±14º	63º±15º
CYTOP/ZnO/Al	114º±2º	114º±1º	105º±1º	9º±2º
ZnO/Si	86º±3º	90º±4º	27º±4º	63º±8º
CYTOP/ZnO/Si	122º±2º	123º±2º	95º±4º	28º±6º

Movie S1 (separate file). 0.5 μL droplet moving on a 'roller coaster' formed by a curled acoustic wave device on a 200 μm thick Al sheet with an actuation frequency of 13.6 MHz and an input power of 20 W. The frame rate is 30 fps.

Movie S2 (separate file). 2 μL droplet moving past a hilly surface on a 200 μm thick Al sheet with an actuation frequency of 6.0 MHz and an input power of 6 W. The frame rate is 30 fps.

Movie S3 (separate file). 0.5 μL droplet moving on a twisted surface on a 50 μm thick Al foil with an actuation frequency of 13.1 MHz and an input power of 3 W. The frame rate is 30 fps.