Supporting Information

For

Robust Slippery Coating with Superior Corrosion Resistance and Anti-Icing Performance for AZ31B Mg Alloy Protection

Jialei Zhang[a,b], Changdong Gu*[a,b], Jiangping Tu[a,b]

[a.] School of Materials Science and Engineering, State Key Laboratory of Silicon Materials, Zhejiang University, Hangzhou 310027, China

[b.] Key Laboratory of Advanced Materials and Applications for Batteries of Zhejiang Province, Hangzhou 310027, China

* Corresponding author. E-mail addresses: cdgu@zju.edu.cn; changdong_gu@hotmail.com; (C.D. Gu), Tel./fax: +86 571 87952573.

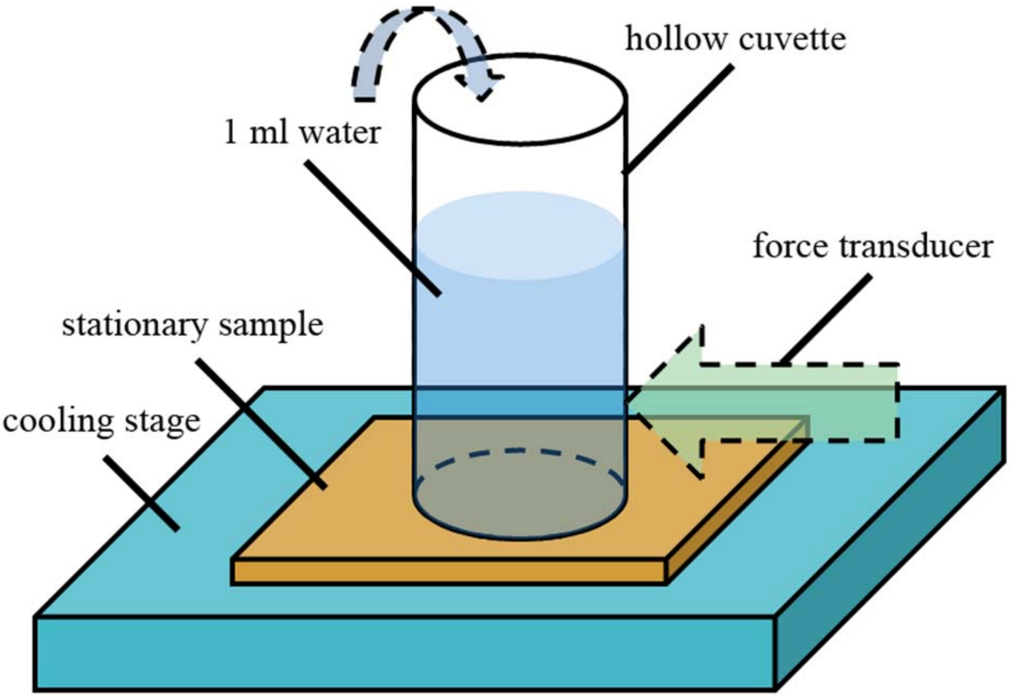

Figure S1. Schematic of a homemade apparatus for ice adhesion strength measurements. About 1 ml de-ionized water was poured into the hollow cuvette and frozen on the stationary sample. The cross-section area of the water column was ~0.68 cm^2 and the cooling stage was set at -20±2 °C. A force transducer was slowly propelled and the maximum force for cuvette moving was recorded. Ice adhesion strength was calculated using the measured force and the known cross-section area of the ice-substrate interface.

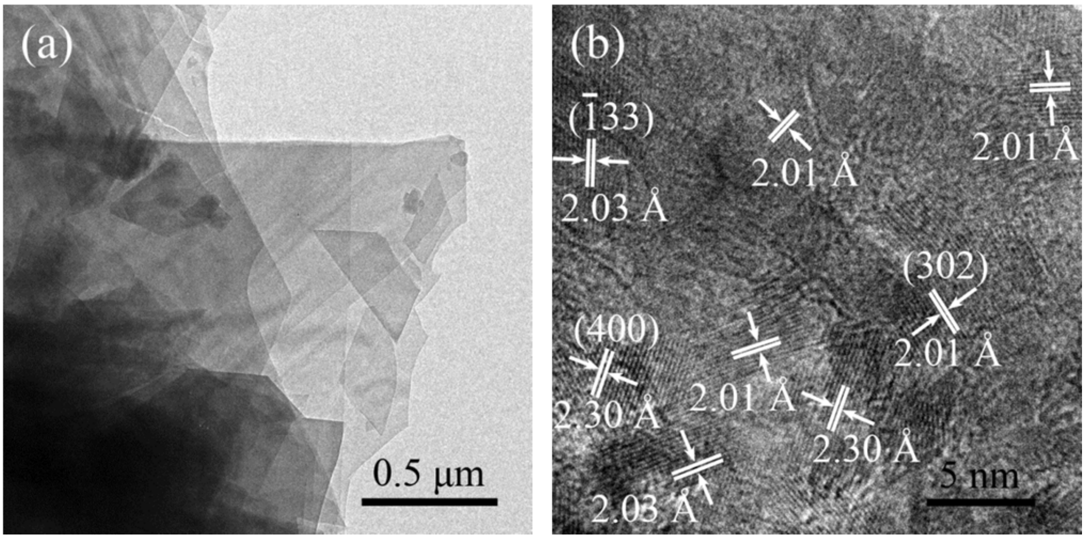

Figure S2. TEM (a) and HR-TEM (b) images of the debris scraped from the hydrothermally prepared coating. The lattice fringes in (b) are assigned to $Mg_5(CO_3)_4(OH)_2$.

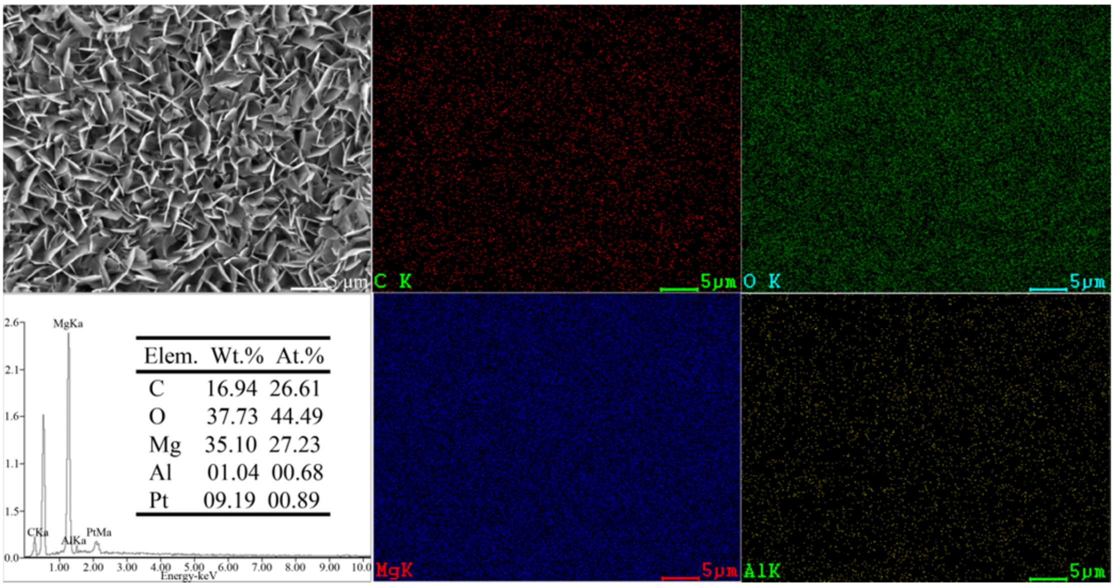

Figure S3. EDS analyses of the hydrothermally prepared LDH/carbonate composite coating on Mg alloy.

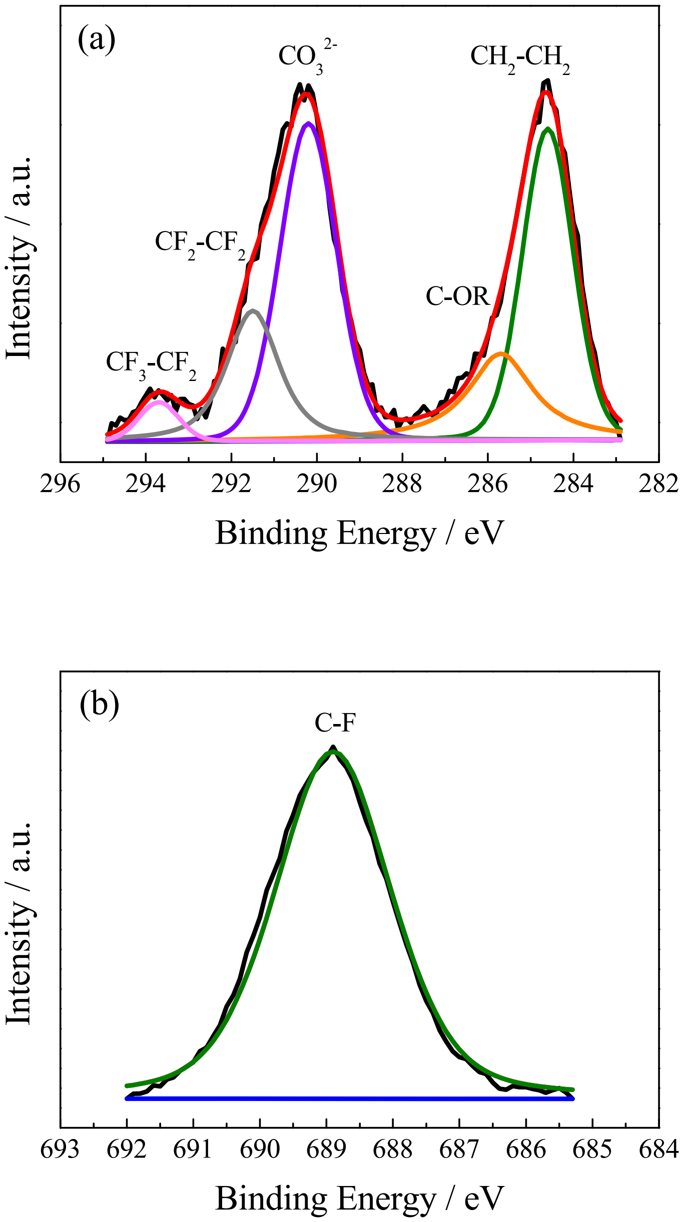

Figure S4. XPS core-level spectra of the PTES modified coating. (a) C 1s, (b) F 1s. The peaks located at BEs of 284.6, 285.7, 289.6, 291.5 and 293.7 eV in (a) are corresponding to CH_2-CH_2, C-OR, CO_3^{2-}, CF_2-CF_2 and CF_3-CF_2 groups, respectively. The only peak located at BE of 688.9 eV in (b) is assigned to C-F species.

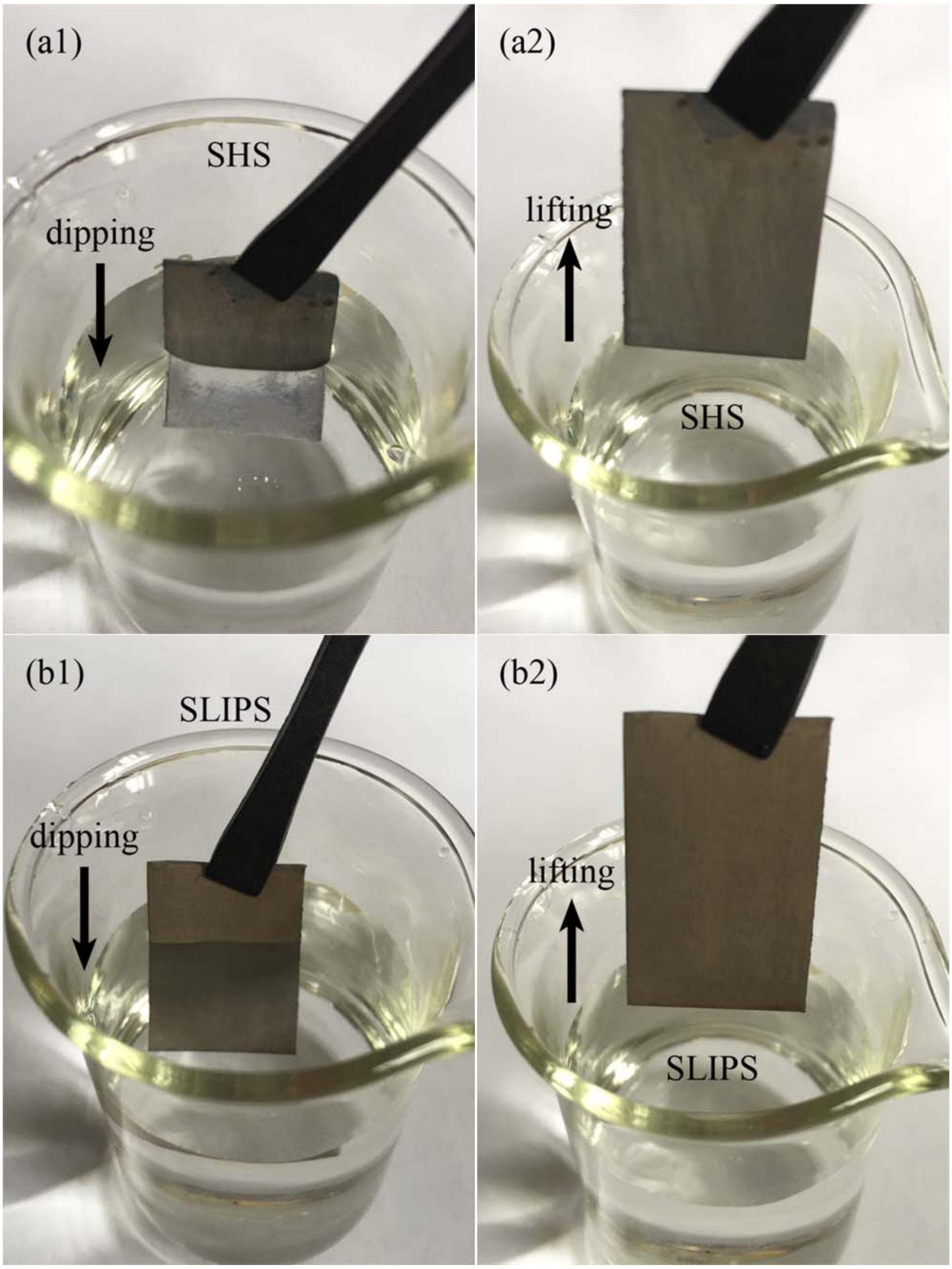

Figure S5. Water repellency of the SHS (a) and SLIPS (b) coated Mg alloys performed by dipping them into de-ionized water (a1, b1) and lifting them up (a2, b2).

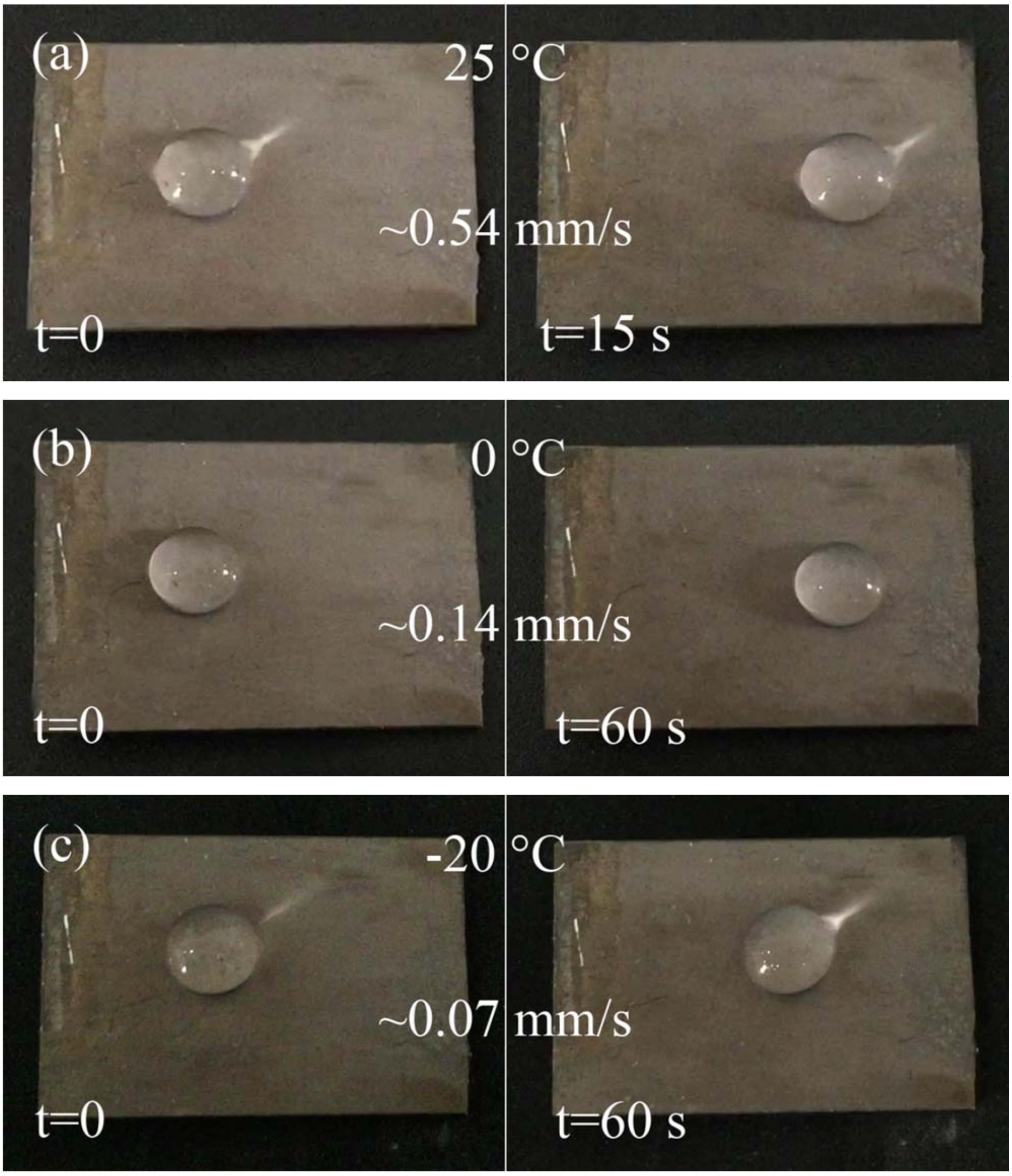

Figure S6. Sliding velocity of a 50 μL water droplet on the SLIPS coated Mg alloy (25 mm × 15 mm × 1 mm) at (a) 25 °C (b) 0 °C and (c) -20 °C as the substrate is tilted by ~10°.

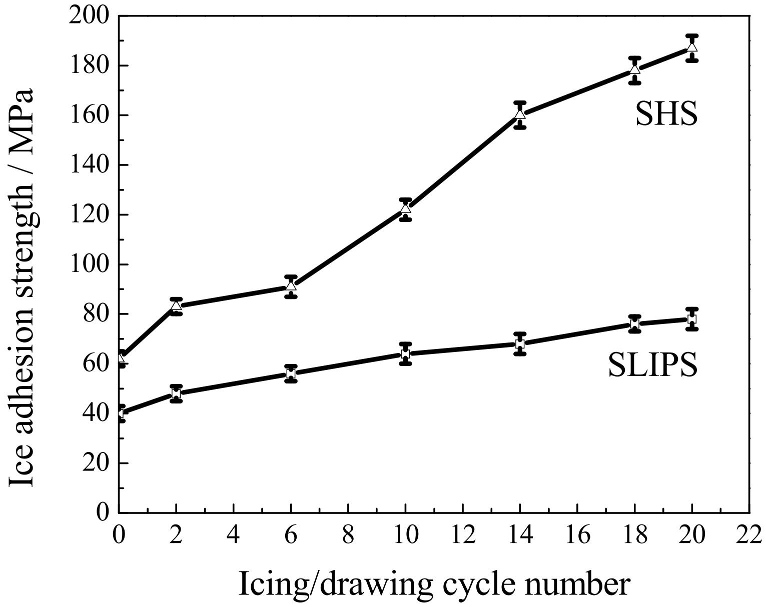

Figure S7. Ice adhesion strength change for the SHS and SLIPS coatings during the cycles of icing/drawing in the anti-icing test. The significant increase of ice adhesion strength for the SHS coating indicates a destructed surface owing to the scraping and smoothing effects in the cyclic icing/drawing. The slight increase of ice adhesion strength for the SLIPS coating implies a negligible destruction of the SAMs and protruded top layer.

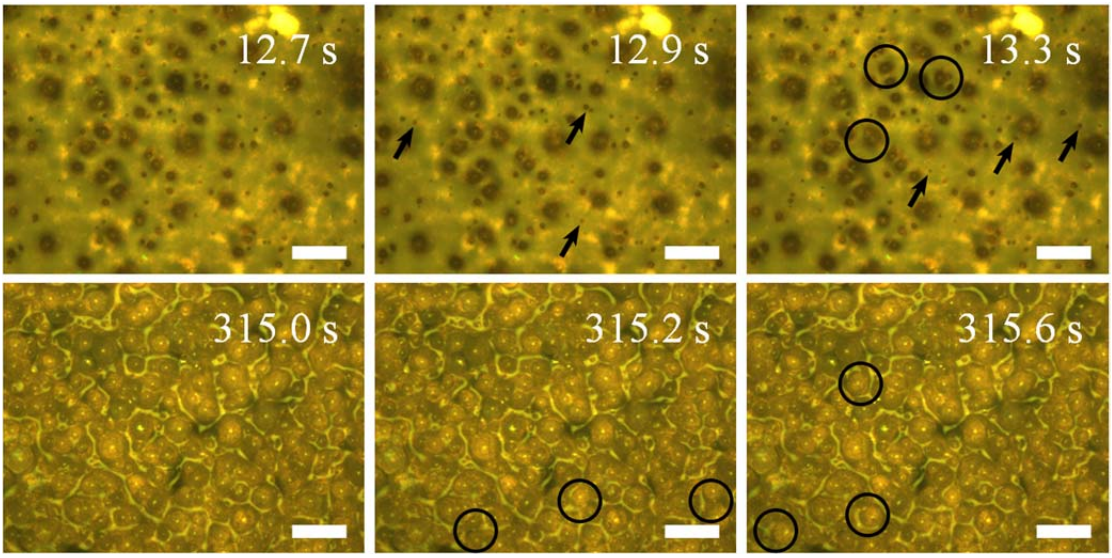

Figure S8. In-situ surface morphology observations of the SLIPS coating on a cooling stage at a temperature of -20 °C. Micrographs were taken at around the initial state and after 5 min. It demonstrates that condensate droplets were randomly formed (indicated by the arrows) on the ultra smooth surface and were gradually coalesced (indicated by the circles) to increase of the droplet size over time. The scale bar is 0.05 mm.

Video S1. A water droplet (5 μl) is slowly slipping off the SLIPS coated Mg alloy as the substrate is tilted by ~3°.