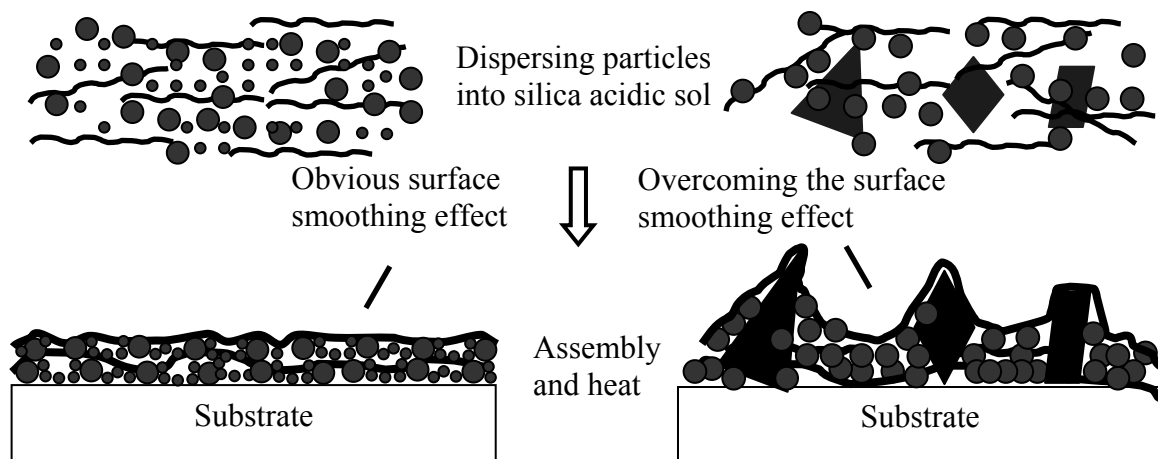


### Supplementary information

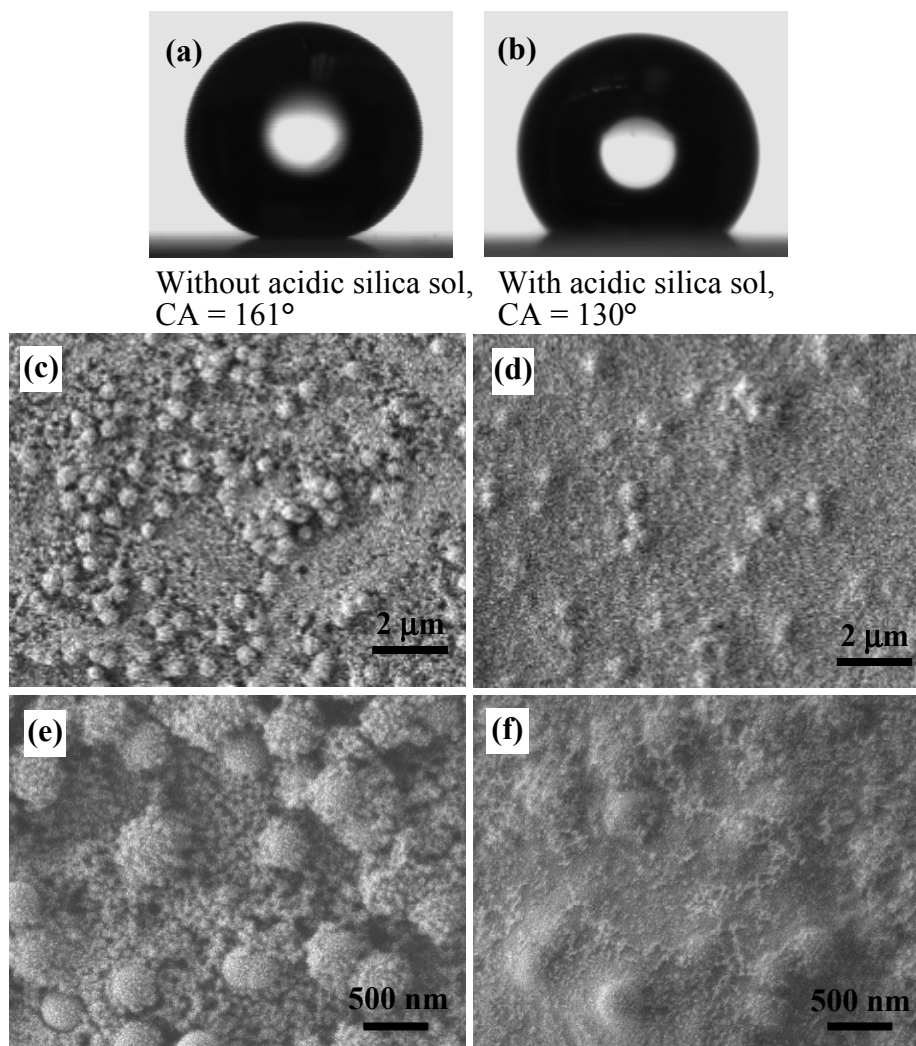
**Figure S1.** Schematics of the bonding process, and the surface smoothing effect of the acidic sol for 400/50 nm silica particles (left) and 2.5/0.4  $\mu\text{m}$  silica particles (right).

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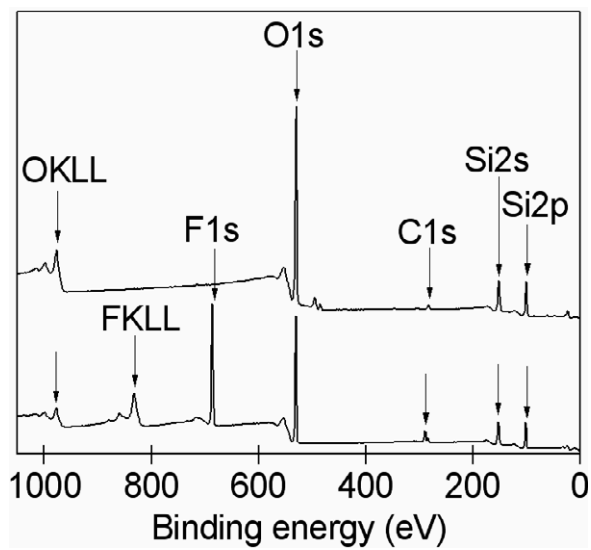


**Figure S2.** Optical images of a water droplet of 3  $\mu\text{L}$  on surfaces by assembling 400/50 nm silica particles without (a) and with (b) the addition of acidic silica sol. **And SEM images of surfaces by assembling 400/50 nm silica particles without (c,e) and with (d,f) the addition of acidic silica sol. (e) and (f) are the high magnifications of (c) and (d), respectively.**

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**Figure S3.** XPS results of the changes of the surface chemical composition before and after FAS modification.



**Figure S4.** Contact angles of water droplets with pH values from 0 to 14 on the SH coating with strong adhesive strength.

