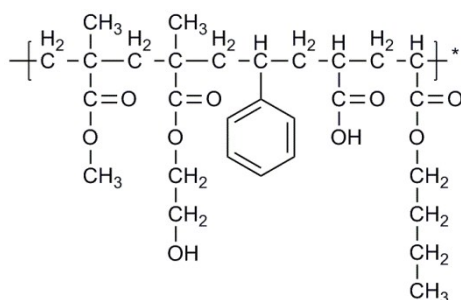
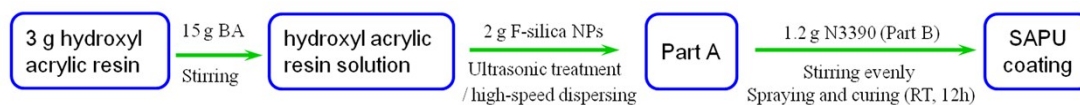


Supplementary information



Scheme S 1. A schematic structure of typical hydroxyl acrylic resin



Scheme S 2. Synthetic procedures of the SAPU coating



Figure S 1. Dispersion of F- SiO₂ NPs in the acrylic resin solution.

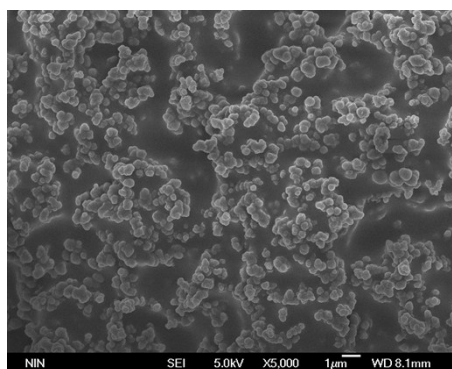


Figure S 2. SEM image of the surface of a SAPU layer with F-SiO₂ content of ca. 35%.

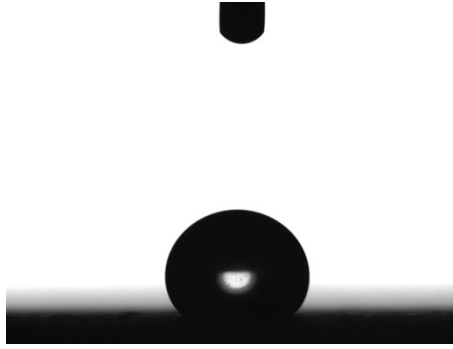


Figure S 3. Contact angle measurement of n-hexadecane on the SAPU coating

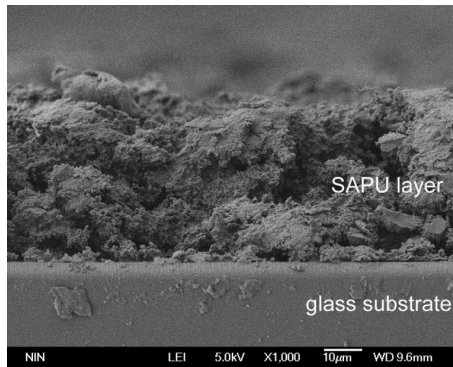


Figure S 4. A full vision of the cross-section of SAPU layer (with F-SiO₂ of ca. 39%) examined with SEM.

Table S1. Weight loss of the APU and SAPU layers after abrasion

Number of abrasion cycles	50	100	150	200
APU(mg)	0.5	1.3	1.9	2.4
SAPU(mg)	0.7	1.1	1.6	2.0

* The initial weights of the APU and SAPU layers are ca. 43.69 and ca. 64.5 mg, respectively.

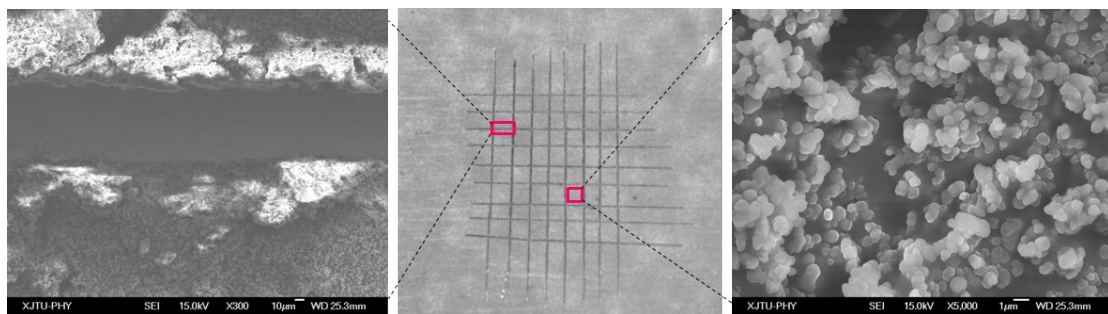


Figure S 5. Optical (middle) and SEM images (left & right) of SAPU coating surface after the cross cutting test of adhesion

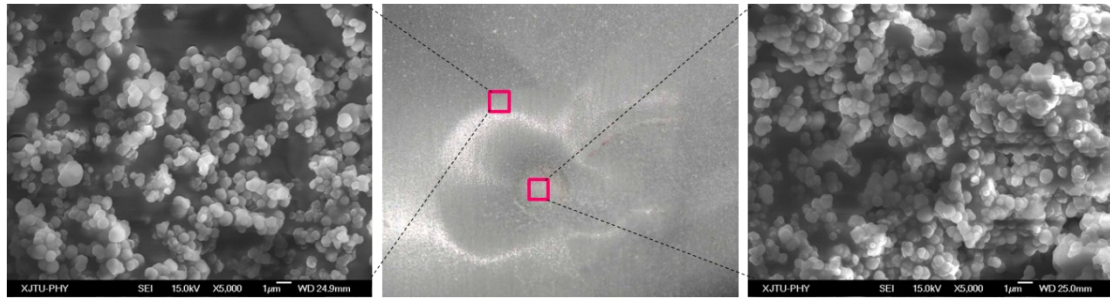


Figure S 6. Optical (middle) and SEM images (left & right) of SAPU coating surface after the hammer falling test of impact resistance.



Figure S 7. A camera image of an SAPU coating (as shown in video 3) with its right half side has been immersed in hydrochloric acid solution for 12 h. The red separation line on the SAPU coating during immersion has been erased for a better visual effect.