

Electronic Supplementary Information for

Water and mildew proof SiO₂&ZnO/silica sol superhydrophobic composite coating on a circuit board

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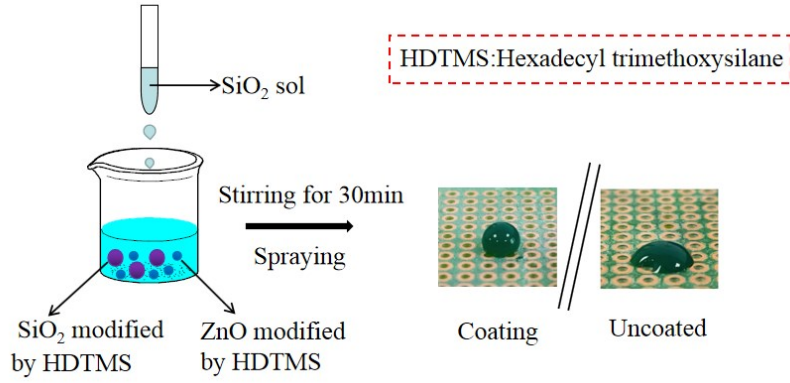


Fig. 1 Preparation of superhydrophobic coating.

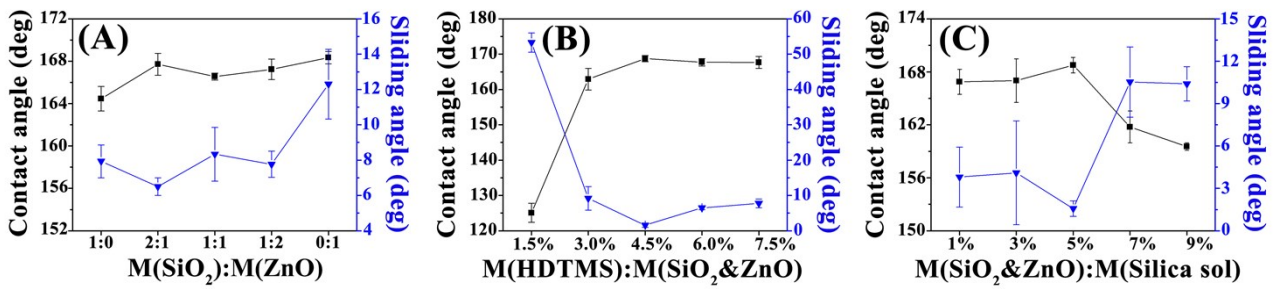


Fig. 2 The effect of SiO₂ and ZnO quality ratio on hydrophobicity of coating (A); The effect of mass ratio of surface modifier and nanoparticles on hydrophobicity of coating (B); The effect of the mass ratio of nano particles and silica sol on hydrophobic properties of coating (C).

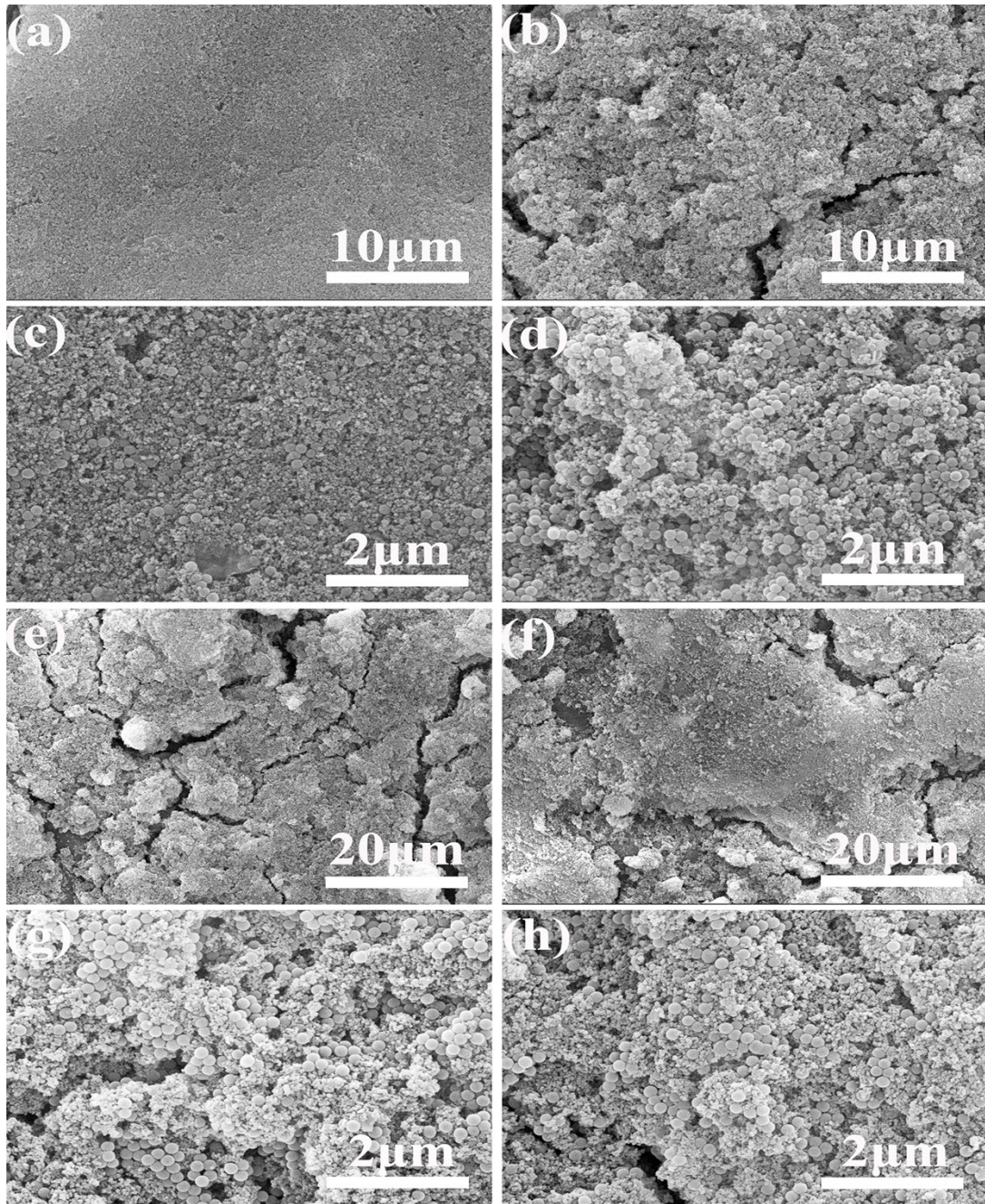


Fig. 3 SEM images of different samples. SEM with mass ratio of SiO_2 to ZnO 1:0 (a,c); SEM with mass ratio of SiO_2 to ZnO 1:1 (b,d); SEM with 1% mass ratio of nano particles to silica sol (e,g); SEM with 1% mass ratio of nano particles to silica sol (f,h).

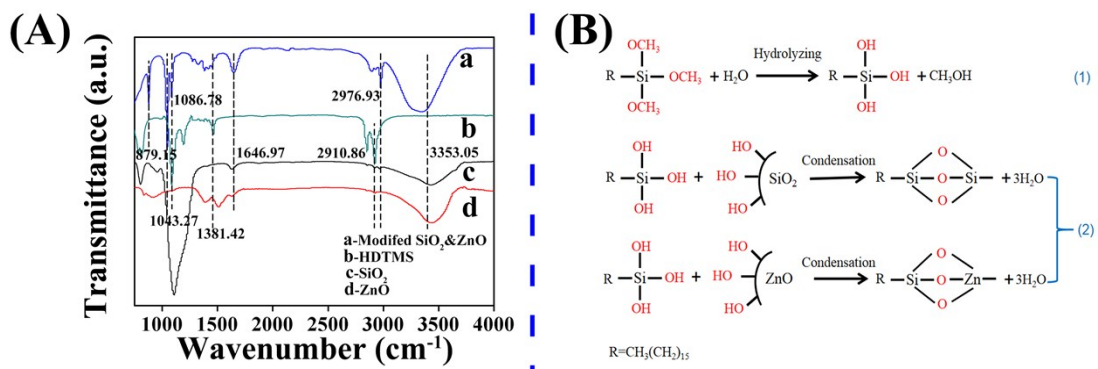


Fig. 4 FTIR spectra of different samples (A); Possible reaction mechanism of HDTMS modified nanoparticles (B).

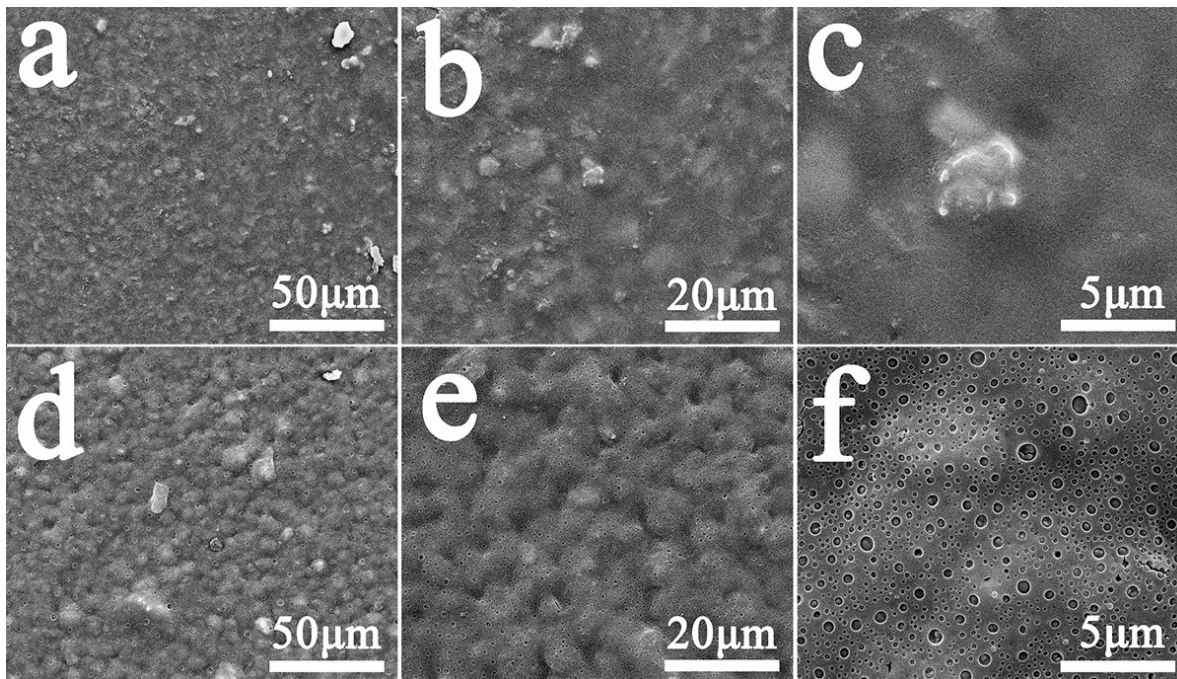


Fig. 5 SEM of pristine PCB surface (a-c); SEM of superhydrophobic PCB surface (d-f).

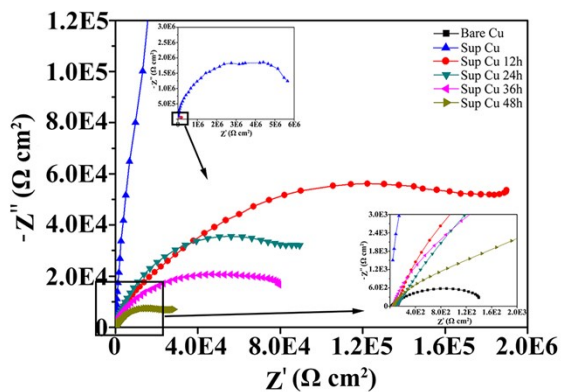
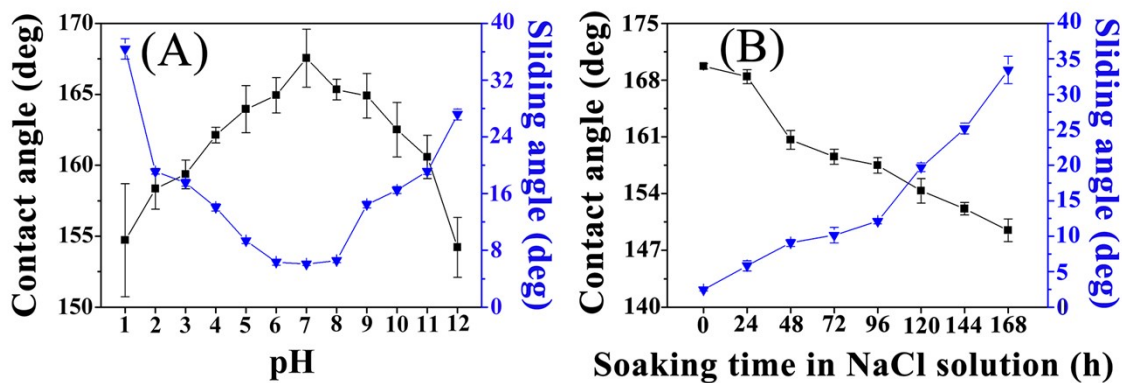


fig. 6 Wettability diagram of samples soaked in different pH aqueous solutions for 12h (A); Wettability of samples immersed in NaCl (3.5wt%) aqueous solutions for different time (B); Nyquist plots of different samples (C).

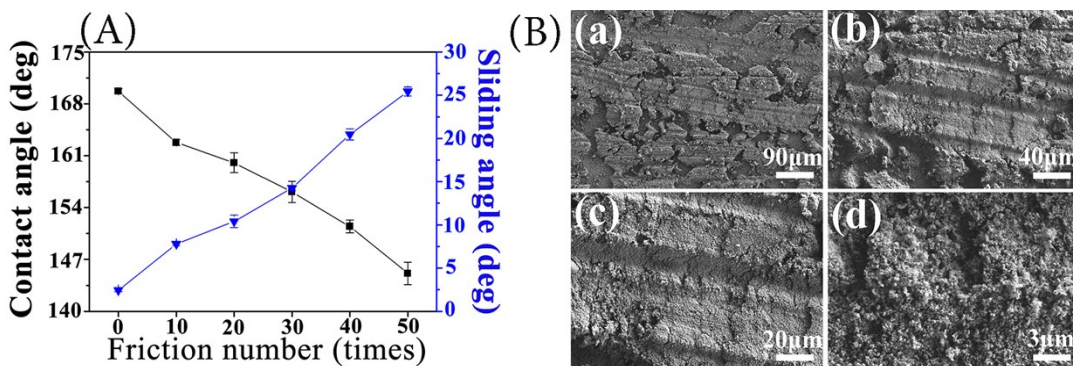


Fig. 7 Relationship between friction times and wettability of samples (A); SEM of the worn surface of the sample for 50times (B).

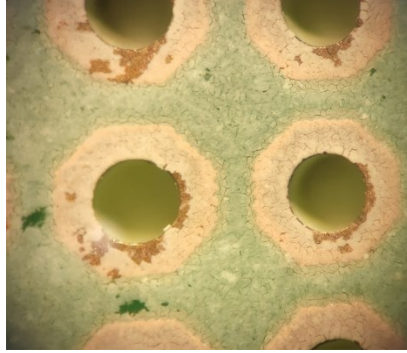


Fig. 8 Sample magnification 50 times.

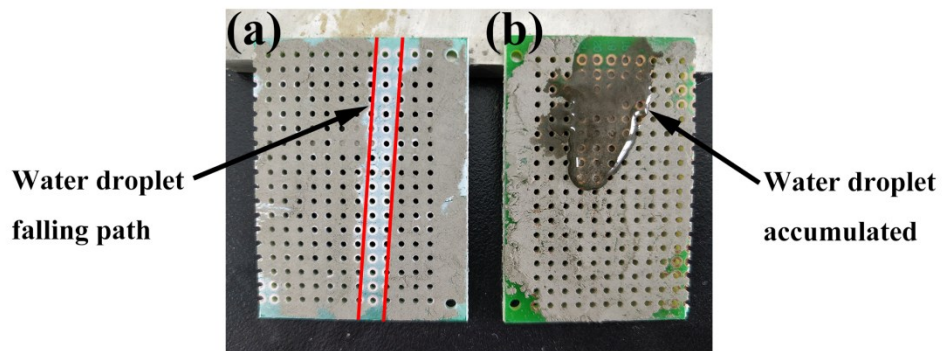
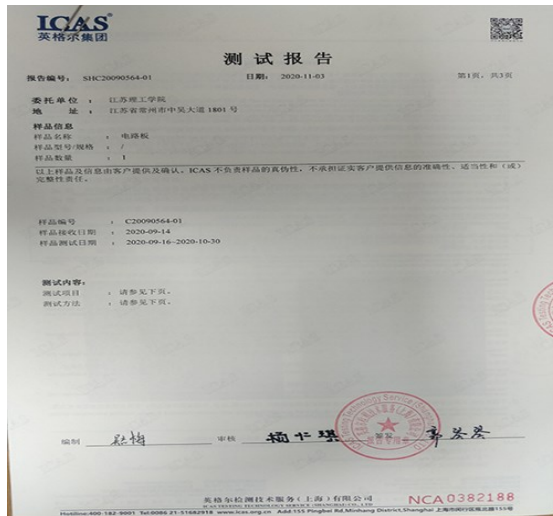


Fig. 9 Self cleaning properties of the superhydrophobic PCB as compared with the pristine PCB. Cement soils were washed away by the water droplets impacted onto the superhydrophobic PCB (a) and wetted by the water droplets impacted to the pristine PCB (b).



ICAS
The test report
Report number: SHC20090564-01 Date: 2020-11-03 Page 1 of 3
Entrust unit: Jiangsu University of Technology
Address: 1801 Zhongwu Avenue, Changzhou City, Jiangsu Province
The sample name: Circuit board
The sample type: /
The sample quantity: 1

The above samples and information provided by the customer and confirm. Samples of ICAS is not responsible for the authenticity of sex, do not assume confirmed that provide information accuracy, appropriateness and (or) integrity responsibility.

Sample number: C20090564 - 01
Sample receive date: 2020-09-14
Sample test date: 2020-09-16~2020-10-30

The test content:
Test project: Please see page 2
The test method: Please see page 2.

Organization Jiemei Wu Review Reiqi Yang Issue Qinqin Guo



ICAS
The test report
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Test results:
Sample description: flake
Test method: GB/T 2423.16-2008-part 2: Electrical and electronic products environmental test experiment method J and guideline: long says, test method 1
Test strains: Aspergillus niger ATCC 6275, Earth aspergillus ATCC 10690, Chaetomium globosum ATCC 6205, DSM resins (berk) 1203, Commend WanShi quasi green ATCC 18502, Rope green screen ATCC 36839, Short ATCC 36840, Green ATCC 9645.

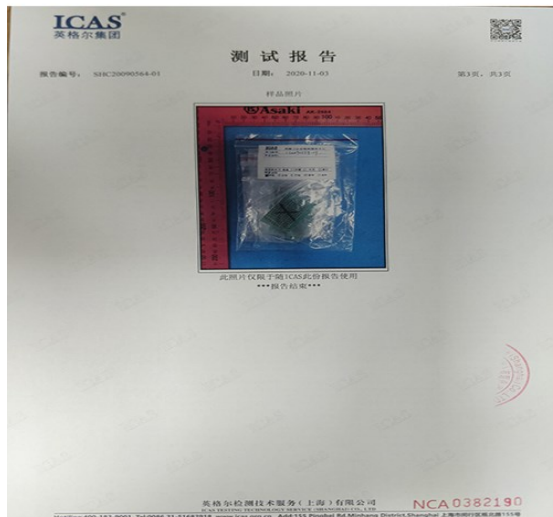
Test conditions: 28 days, humidity greater than 90% RH, temperature 28°C.
Evaluation standard
Level 0 Magnified 50 times, found no obvious mold;
Level 1 Under a microscope to see mold;
Level 2a The naked eye or under a microscope to see scattered sparse grow, bureau secretary mold, mold area of no more than 5% of the test area;
Level 2b Obvious to the naked eye to see a lot of places more or less uniform mold, but in the surface area covered less than 25%;
Level 3 The naked eye mold, mold area of more than 25% of the test area.

Test results: Test project The degree of mold/Long said level Antivirus performance Magnified 50 times, found no obvious mold/Level 0 13753 is nMildew test pictures 28 days

Test project	The degree of powdery mildew resistance	Level
Powdery mildew resistance	Under a 50-fold microscope, no powdery mildew detected	Level 0



Pictures after 28 days of mould proof experiment



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Sample photos



This photo is limited to ICAS used this report, end of report

Fig. 10 Antibacterial test report

Table 1 EDS comparison between pristine and superhydrophobic PCB

Element Wt% PCB	Pristine PCB	Superhydrophobic PCB
C	53.49	59.46
N	03.05	04.65
O	09.94	04.37
Si	01.19	02.73
Zn	00.06	00.63