



## Supplementary Material

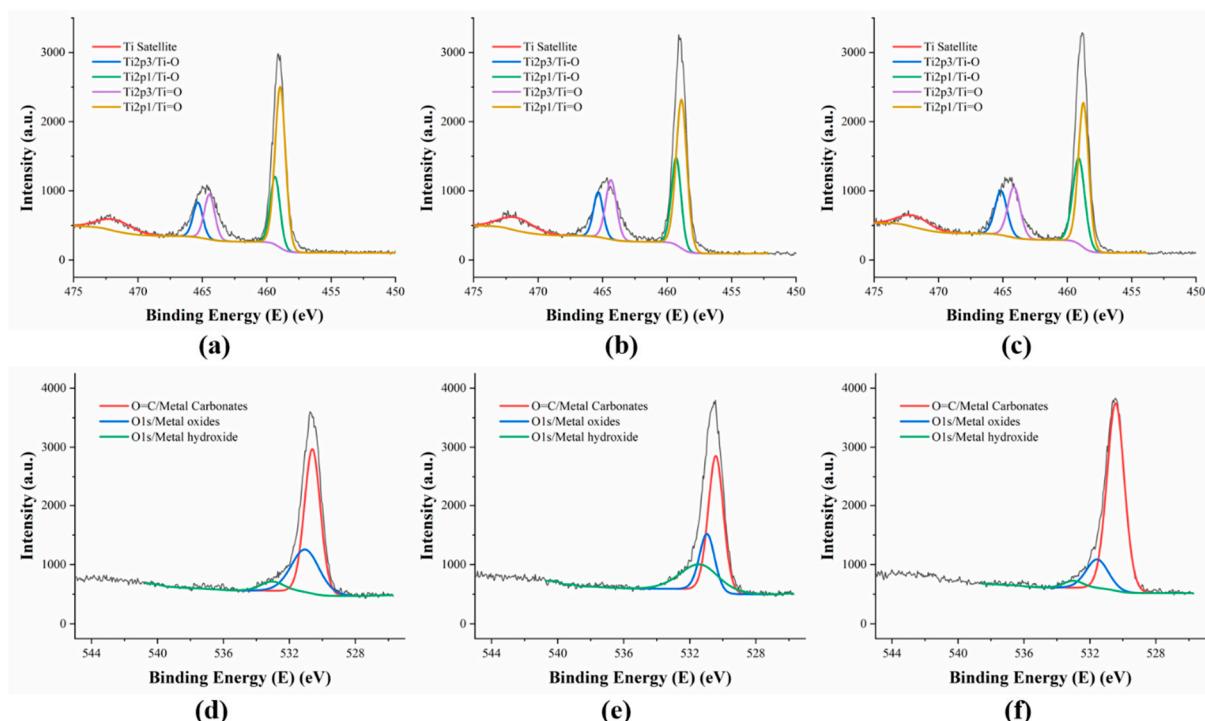
# Fabrication of Functional Super-hydrophilic TiO<sub>2</sub> Thin Film for pH Detection

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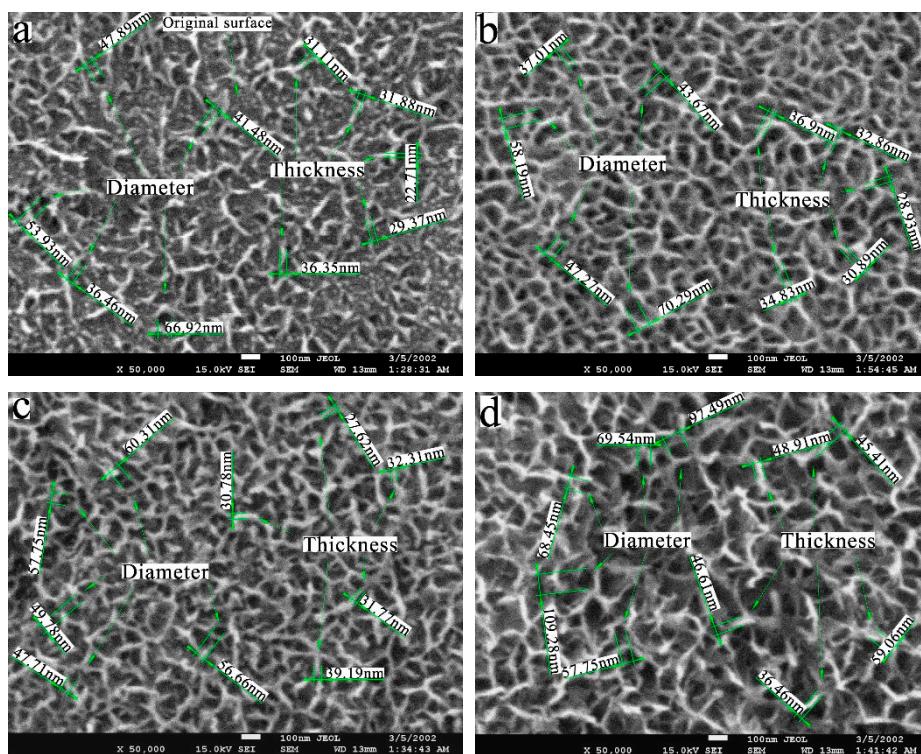
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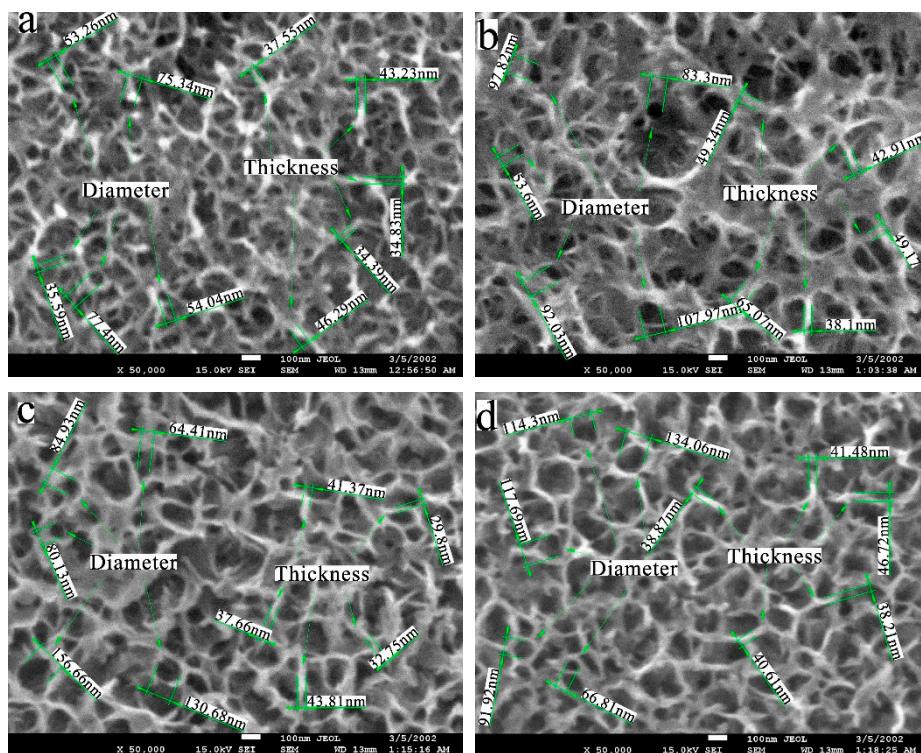
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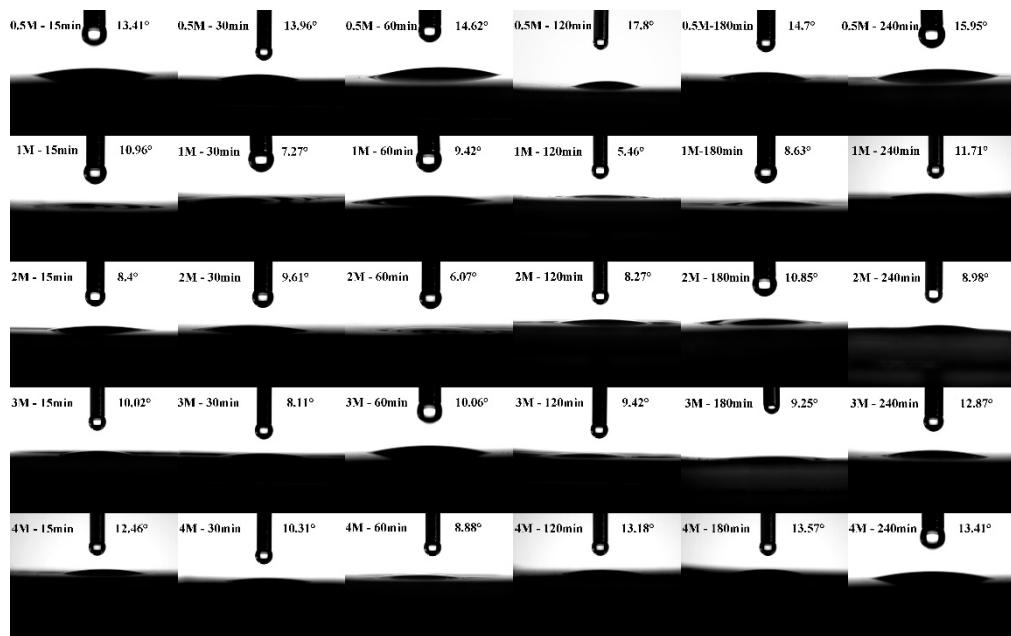
**Figure S1.** Ti 2p deconvoluted core excitations for electrode treated by using (a) 1 M–240 min, (b) 4 M–120 min, (c) 4 M–240 min, and O 1s deconvoluted core excitations for electrode treated by using (d) 1 M–240 min, (e) 4 M–120 min, (f) 4 M–240 min.



**Figure S2.** SEM images of TiO<sub>2</sub> electrodes prepared in 1M NaOH for (a) 15 min, (b) 60 min, (c) 120 min and (d) 240 min with the size of pores and ridges.



**Figure S3.** SEM images of TiO<sub>2</sub> electrodes prepared in 4M NaOH for (a) 15 min, (b) 60 min, (c) 120 min and (d) 240 min with the size of pores and ridges.



**Figure S4.** One  $\mu\text{L}$  water droplet contact angle measurements on the electrodes obtained with different fabrication parameters.

**Table S1.** The atomic ratios and parameters of the deconvoluted XPS spectra for different electrodes.

Treatment condition	Excitation	Component	Binding energy (eV)	Atomic %
1 M 120 min	Ti2p	Ti2p3/Ti-O	459.3	4.7
		Ti2p1/Ti-O	465.45	5.13
		Ti2p3/Ti=O	458.9	7.99
		Ti2p1/Ti=O	464.7	8.86
	O1s	O1s/Metal oxides	530.6	15.16
		O1s/Metal hydroxide	533	1.92
	Na1s	Na1s	1072.15	1.92
	Ti2p	Ti2p3/Ti-O	459.35	4.11
		Ti2p1/Ti-O	465.35	4.56
		Ti2p3/Ti=O	458.95	10.4
		Ti2p1/Ti=O	464.45	6.26
1 M 240 min	O1s	O1s/Metal oxides	530.6	30.75
		O1s/Metal hydroxide	533.05	1.88
	Na1s	Na1s	1072.1	2.28
	Ti2p	Ti2p3/Ti-O	459.3	10.19
		Ti2p1/Ti-O	465.35	8.77
		Ti2p3/Ti=O	458.9	5.35
		Ti2p1/Ti=O	464.35	5.94
4 M 120 min	O1s	O1s/Metal oxides	530.45	4.51
		O1s/Metal hydroxide	531.45	0.68
	Na1s	Na1s	1071.6	1.49
	Ti2p	Ti2p3/Ti-O	459.2	9.51
		Ti2p1/Ti-O	465.25	8.6
		Ti2p3/Ti=O	458.85	6.59
		Ti2p1/Ti=O	464.25	7.31

O1s	O1s/Metal oxides	530.55	16.88
	O1s/Metal hydroxide	533.1	1.23
Na1s	Na1s	1072.55	2.61

**Table S2.** Sensitivity of the electrodes treated with different fabrication parameters.

Solution concentration	Reaction time					
	15 min	30 min	60 min	120 min	180min	240min
0.5 M	46.62	49.07	50.7	50.99	51.2	51.28
1 M	52.8	53.39	53.99	54.13	53.81	53.49
2 M	53.47	53.47	53.42	53.99	53.83	53.25
3 M	52.33	52.62	53.09	53.07	52.82	52.8
4 M	51.78	51.89	52.59	51.85	50.67	50.04

**Table S3.** Comparation of the sensitivity and CA of the electrodes before and after utilization/storage.

Sample	Condi-tions	Contact angle (°)		Sensitivity (mV/pH)	
		fresh	used/stored	fresh	used/stored
Electrode 1	stored for	5.93	7.43	52.71	52.74
Electrode 2	60 days	6.37	7.48	52.49	50.83
Electrode 3	used in so-	7.28	9.71	53.23	52.53
Electrode 4	lutions	6.85	7.21	54.03	53.04