Electronic Supplementary Material (ESI) for Soft Matter.
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Supporting information for:

Estimation of Surface Free Energy at Microstructured Surface to Explore Intermediate Wetting State for Partial Wetting Model

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The typical Nyquist plots and the corresponding fitted curves for Si samples are illustrated in Fig. s1.

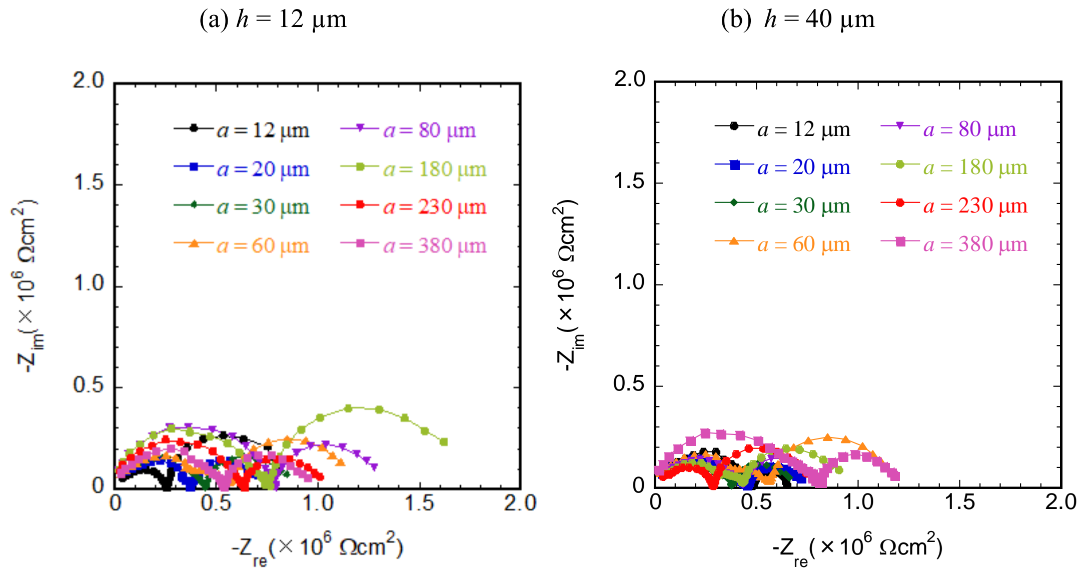

Fig. s1 Nyquist plots of the microstructured Si samples in deionized water for hole height (a) $h = 12$ μm and (b) $h = 40$ μm. Symbols represent the experimental results and lines are the corresponding fitted curves based on the EECs in Fig. s2.

The electrochemical parameters from the measured impedance spectra were analyzed based on the equivalent electrical circuits (EECs) at the solid–liquid interface. The dotted lines shown in Fig. s1 are the fitting curves corresponding to the EECs shown in Fig. s2.

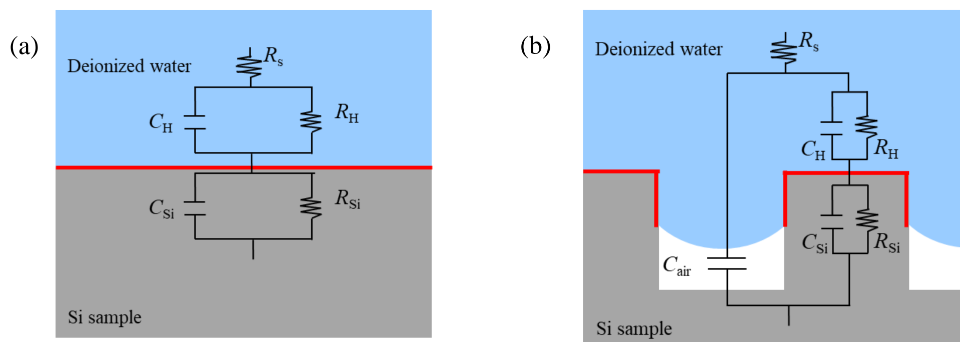

Fig. s2 Schematics of EECs at solid-liquid interface for Nyquist parameter analysis of (a) flat Si, (b) micro-patterned Si.

The obtained electrochemical parameters per unit apparent area, including R_s, R_H, R_{Si}, CPE_H and CPE_{Si}, are listed in Table s1.

Table s1 EIS analytical results for Si samples based on the corresponding EECs.

a (μm)	R_s ($\Omega\cdot cm^2$)	CPE_H		R_H ($\Omega\cdot cm^2$)	CPE_{Si}		R_{si} ($\Omega\cdot cm^2$)
		Q ($\Omega^{-1}s^{-n}/cm^2$)	n		Q ($\Omega^{-1}s^{-n}/cm^2$)	n	
				h = 12 μm			
12	4.25×10^4	6.88×10^{-7}	0.87	3.08×10^5	4.93×10^{-10}	0.75	3.88×10^5
20	3.49×10^4	7.18×10^{-7}	0.93	1.74×10^5	2.72×10^{-10}	0.79	4.56×10^5
30	4.09×10^4	5.53×10^{-7}	0.84	3.51×10^5	5.66×10^{-10}	0.73	4.81×10^5
60	2.94×10^4	1.36×10^{-6}	0.51	3.20×10^5	1.83×10^{-10}	0.82	5.13×10^5
80	3.67×10^4	7.03×10^{-7}	0.88	3.99×10^5	8.35×10^{-10}	0.71	4.44×10^5
180	2.51×10^4	9.34×10^{-7}	0.82	2.68×10^5	1.19×10^{-10}	0.85	6.12×10^5
230	3.09×10^4	6.15×10^{-7}	0.87	2.98×10^5	1.72×10^{-10}	0.82	5.28×10^5
380	3.42×10^4	9.13×10^{-7}	0.86	2.06×10^5	1.53×10^{-10}	0.83	4.29×10^5
				h = 40 μm			
12	3.15×10^4	9.52×10^{-7}	0.83	2.08×10^5	2.08×10^{-10}	0.81	4.91×10^5
20	2.42×10^4	6.24×10^{-7}	0.74	2.80×10^5	1.26×10^{-10}	0.84	7.14×10^5
30	3.44×10^4	1.27×10^{-6}	0.83	1.39×10^5	1.32×10^{-09}	0.69	3.57×10^5
60	3.58×10^4	6.16×10^{-7}	0.93	1.20×10^5	8.82×10^{-10}	0.72	4.15×10^5
80	3.66×10^4	8.07×10^{-7}	0.86	2.39×10^5	6.60×10^{-10}	0.74	3.62×10^5
180	4.32×10^4	9.12×10^{-7}	0.91	1.41×10^5	1.29×10^{-09}	0.69	3.28×10^5
230	3.91×10^4	8.00×10^{-7}	1.00	8.39×10^4	4.20×10^{-09}	0.61	3.15×10^5
380	3.71×10^4	7.68×10^{-7}	0.92	1.21×10^5	5.61×10^{-10}	0.74	3.98×10^5
			Flat Si				
-	4.29×10^4	8.23×10^{-7}	0.95	2.73×10^5	4.88×10^{-10}	0.75	2.99×10^5

For each microstructured Si surface, the EIS measurement and EECs analysis was conducted five times. The measured effective wetting ratio and standard derivation results are shown in Table s2.

Table s2 A'_{sl}/A_{sl} for microstructured Si samples.

a [μm]	A'_{sl}/A_{sl} [-]	
	h = 12 μm	h = 40 μm
12	0.769±0.104	1.215±0.177
20	1.052±0.085	1.091±0.134
30	0.755±0.095	0.976±0.135
60	0.642±0.073	1.063±0.126
80	0.587±0.055	1.056±0.051
180	0.648±0.044	0.945±0.117
230	0.862±0.060	0.986±0.151
380	1.251±0.249	0.865±0.113