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Supporting Information

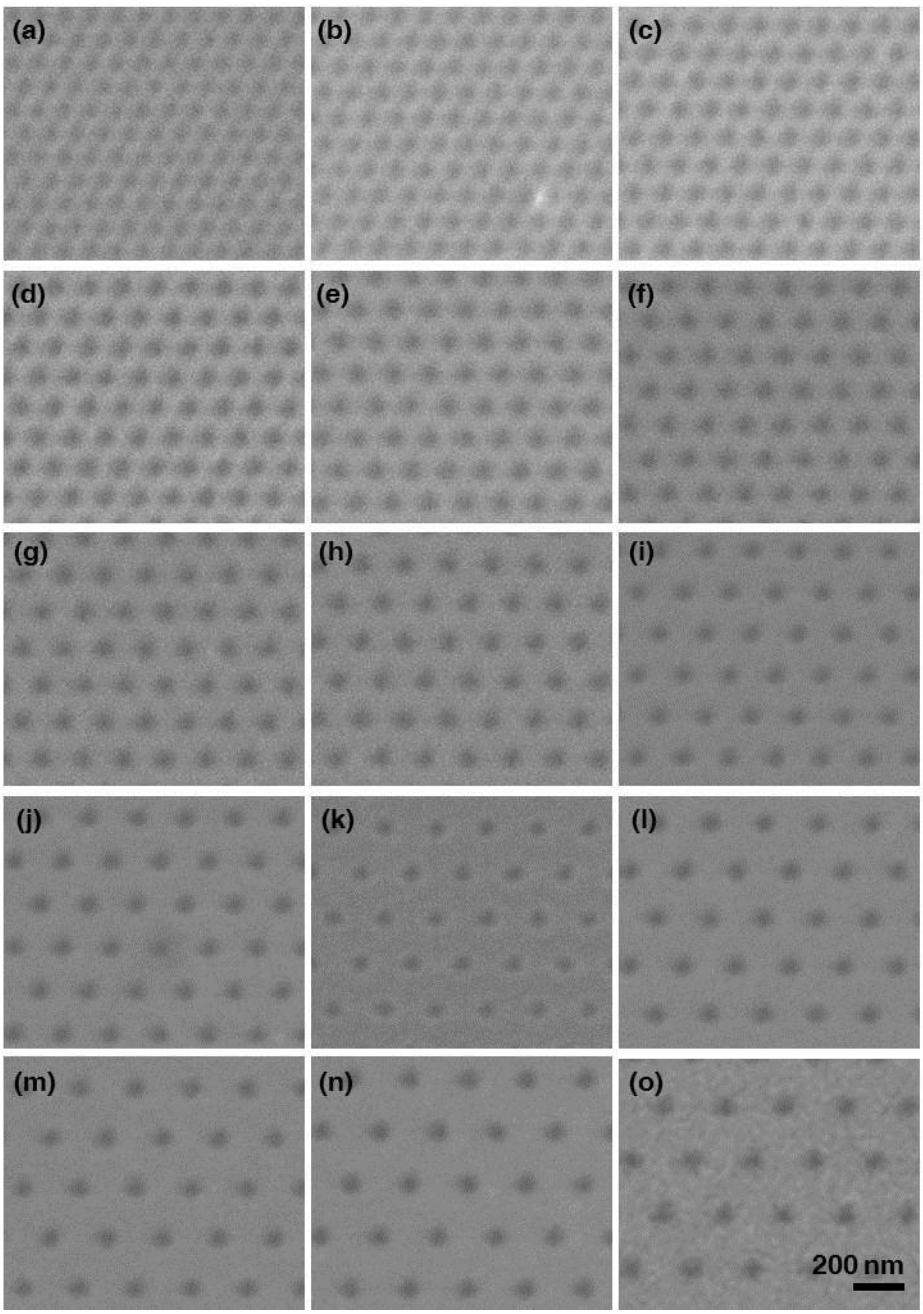

Figure S1. SEM images of the FIB-patterned aluminium foil surface. The FIB patterns are set with different interpore distances: (a) 100 nm, (b) 110 nm, (c) 120 nm, (d) 130 nm, (e) 140 nm, (f) 150 nm, (g) 160 nm, (h) 170 nm, (i) 180 nm, (j) 190 nm, (k) 200 nm, (l) 210 nm, (m) 220 nm, (n) 230 nm, and (o) 240 nm.

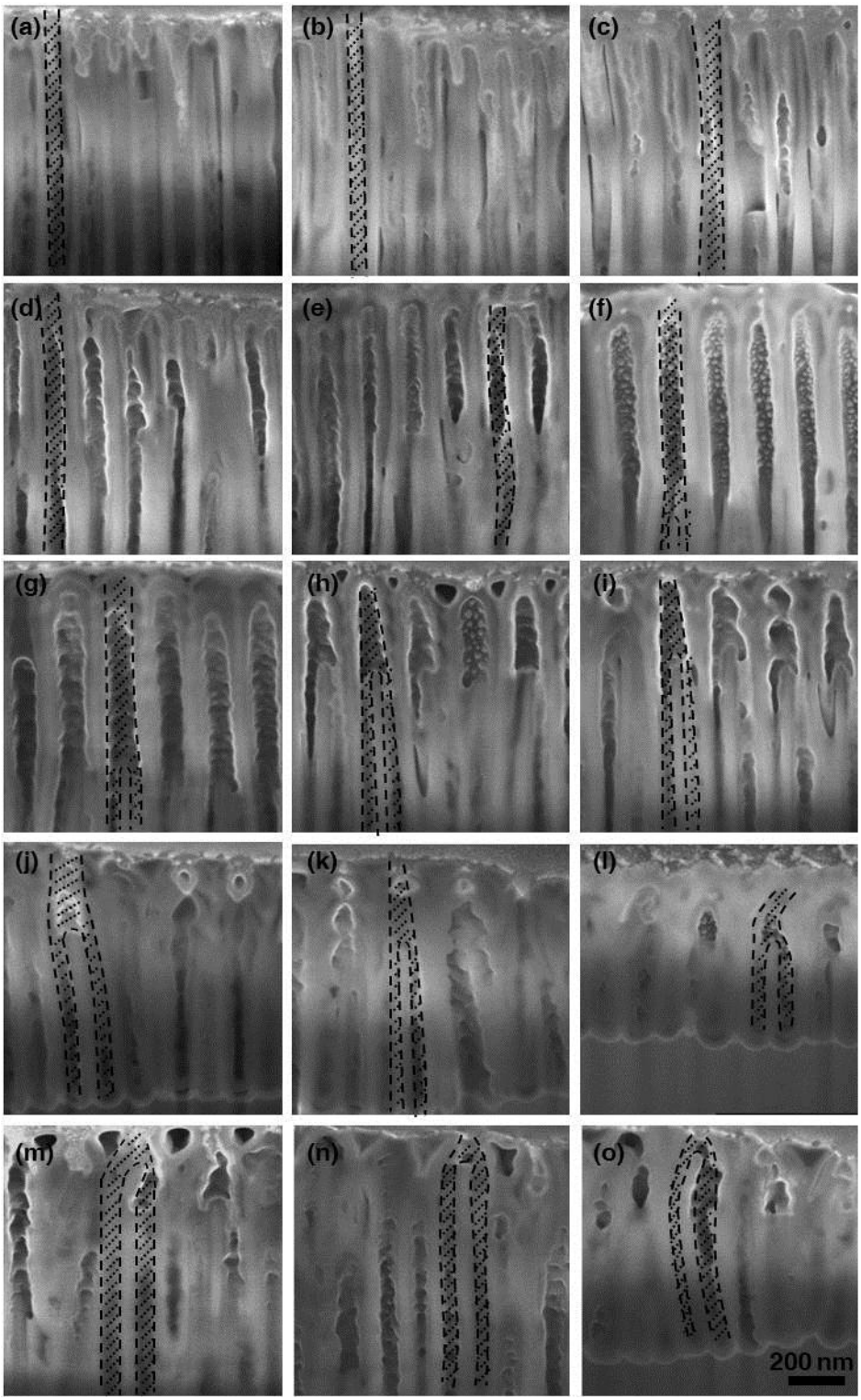

Figure S2. SEM cross-section images of anodized nanopore patterns in 0.3M oxalic acid with a steady state potential of 40 V for 3 hr. The FIB patterns are set with different interpore distances: (a) 100 nm, (b) 110 nm, (c) 120 nm, (d) 130 nm, (e) 140 nm, (f) 150 nm, (g) 160 nm, (h) 170 nm, (i) 180 nm, (j) 190 nm, (k) 200 nm, (l) 210 nm, (m) 220 nm, (n) 230 nm and (o) 240 nm.

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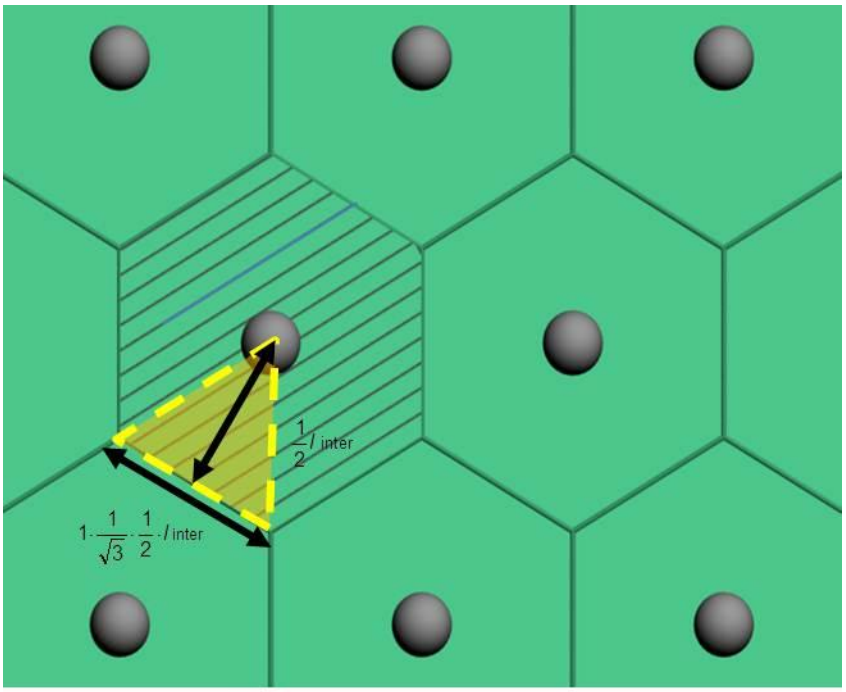

$$Area\ A_{inter} = \left(\frac{1}{\sqrt{3}} \cdot l_{inter}\right) \cdot \left(\frac{1}{2} \cdot l_{inter}\right) \cdot 6$$

Figure S3. Graphical description of theoretical maximum area occupied with a nanopore.

Ideal interpore distance under the condition of anodic oxidation in 0.3M oxalic acid at 10 ℃ under 40 V is 100 nm. When the interpore distances are tuned in a range of 110 to 240 nm, the maximum area which can be occupied with the nanopore is adjusted in accordance with interpore distances with assumption that each nanopore maintains their straightness. The maximum area with 100 nm interpore distance, A100, compared to area Aint in a range of 110 to 240 nm interpore distances. From 110 to 140 nm, the ratios of Aint to A100 are less than double and thus the nanopores can be tilted without new nanochennal formation. Two or three nanopores can lead off the prepatterned nanopore with interpore distances in a range of 150 nm to 190 nm in terms of area calculation. At distances over 200 nm, newly formed four nanopores can be arranged in a shape of an inverted tetrahedron. The three dimensional sub nanopores array can explain the round flask-shaped barrier layer formation.

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Table S1. Theoretical maximum area occupied with a nanopore with a certain interpore distance.

	x	
Interpore distance (nm)	Area (nm^2)	Ratio of A_{int} to A_{100}
100	8660.25	1.00
110	10478.91	1.21
120	12470.77	1.44
130	14635.83	1.69
140	16974.1	1.96
150	19485.57	2.25
160	22170.25	2.56
170	25028.13	2.89
180	28059.22	3.24
190	31263.52	3.61
200	34641.02	4.00
210	38191.72	4.41
220	41915.63	4.84
230	45812.74	5.29
240	49883.06	5.76