# Electronic Supplementary Information: Additional Characterization of AAO

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The AFM surface topography of the starting Al substrate after pretreatment is shown in Figure S1. Typical current density (I-t) curves for the first and second anodization in oxalic and phosphoric acid are shown in Fig. S2.

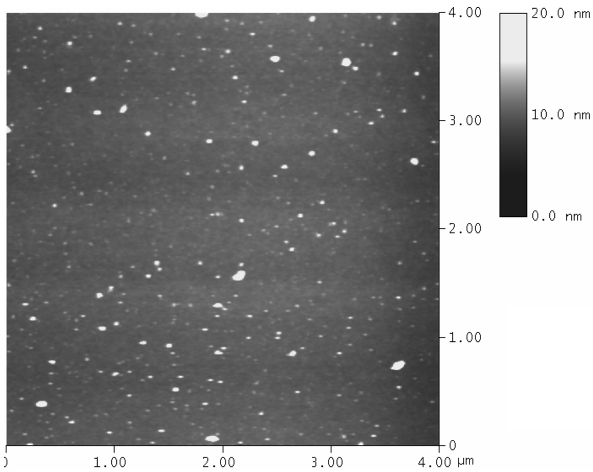


**Figure S1.** AFM topography of an electropolished aluminum substrate surface. RMS roughness is 1.2 nm.

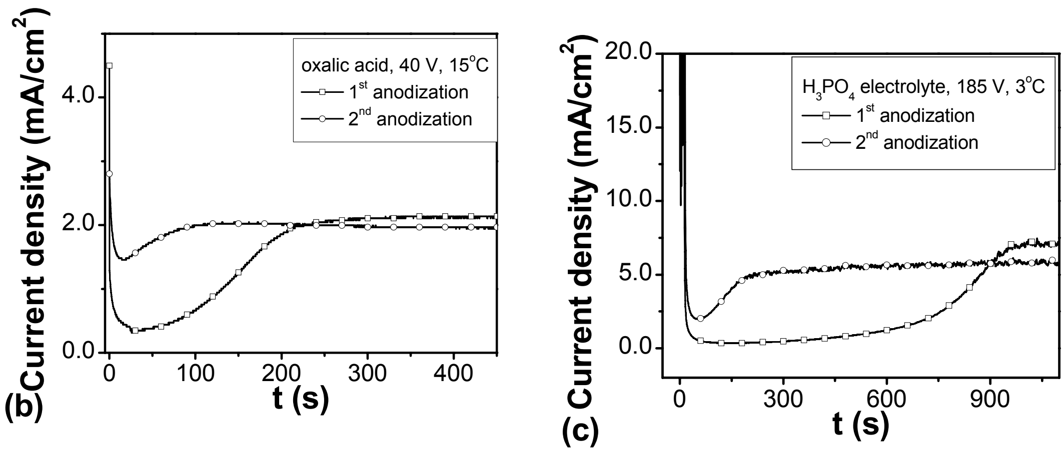


**Figure S2**. Typical anodization curves (current density vs. time, I-t) for two-step aluminum anodization in: (a) oxalic acid (0.3 M $(COOH)_2$, 40 V, 15°C; and (b) phosphoric acid (1 M $H_3PO_4$, 185 V, 3°C).

Supplementary Material (ESI) for Nanoscale


SEM images of large areas of AAO films anodized in oxalic acid and the cross-sectional view of the nanochannels after the 3rd anodization are shown in Fig. S3. Regularly patterned domains up to 2×2 $\mu m^2$ (Fig. S3(a) and (b)), together with straight channels and uniform pore diameter (Fig. S3(c)) can be discerned. Within the ordered domains, each pore is surrounded by six hexagonally ordered pores, which are interconnected by columnar Al oxide, forming a network structure.

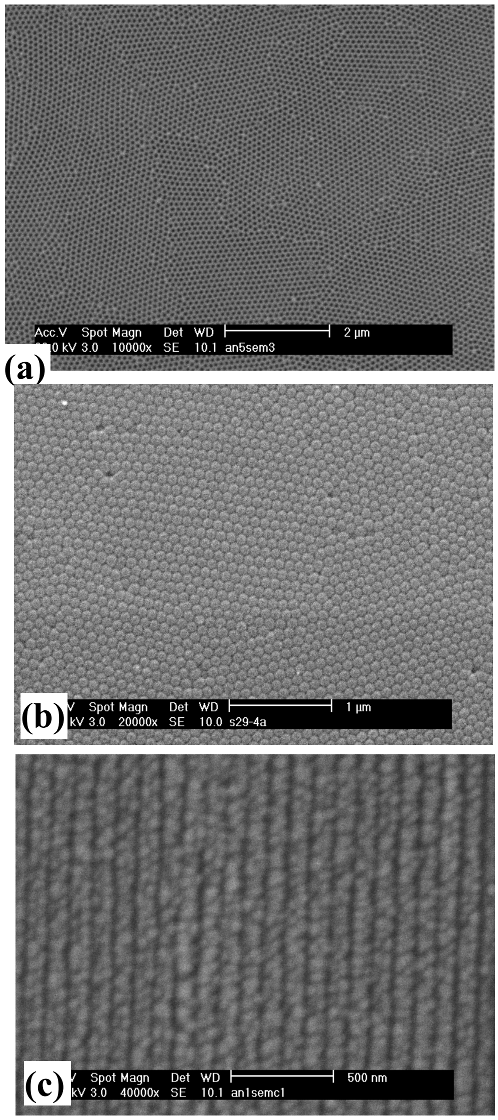


**Figure S3**. SEM large area micrographs of oxalic acid anodized porous alumina after 3rd anodization: (a) front side; (b) barrier side; (c) cross-sectional view.

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AAO membranes were also grown in sulfuric (Fig. S4 and S5) and phosphoric acid (Fig. S6) solutions. The morphologies are similar to those of oxalic acid anodized AAO; the pore diameter and periodicity however are different, corresponding to their specific anodization voltage (Table 1). AAO anodized in sulfuric acid shows a highly ordered pore pattern, while AAO anodized in $H_3PO_4$ is the least ordered, in agreement with Ref. 22.

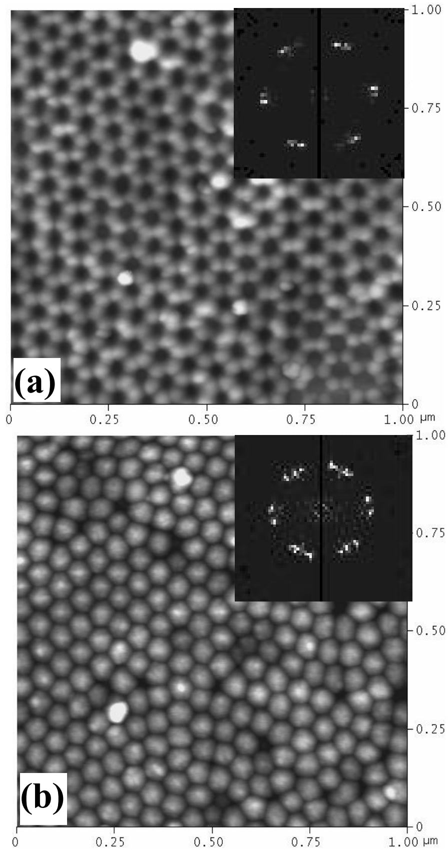


**Figure S4**. AFM surface topography of sulfuric acid anodized porous alumina after 3rd anodization and the fast Fourier transform (FFT) patterns: (a) front side, and (b) barrier side.

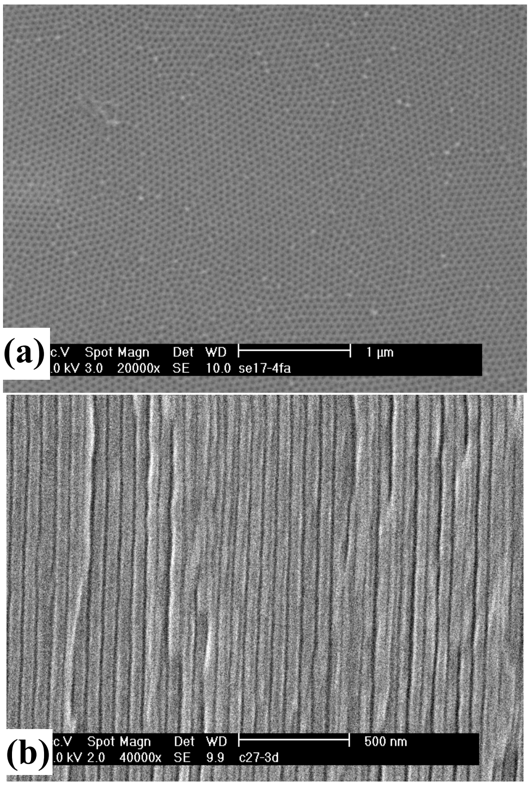


**Figure S5**. SEM large area micrographs of sulfuric acid anodized porous alumina after 3$^{rd}$ anodization: (a) front side; (b) cross-sectional view (mid way through the thickness).

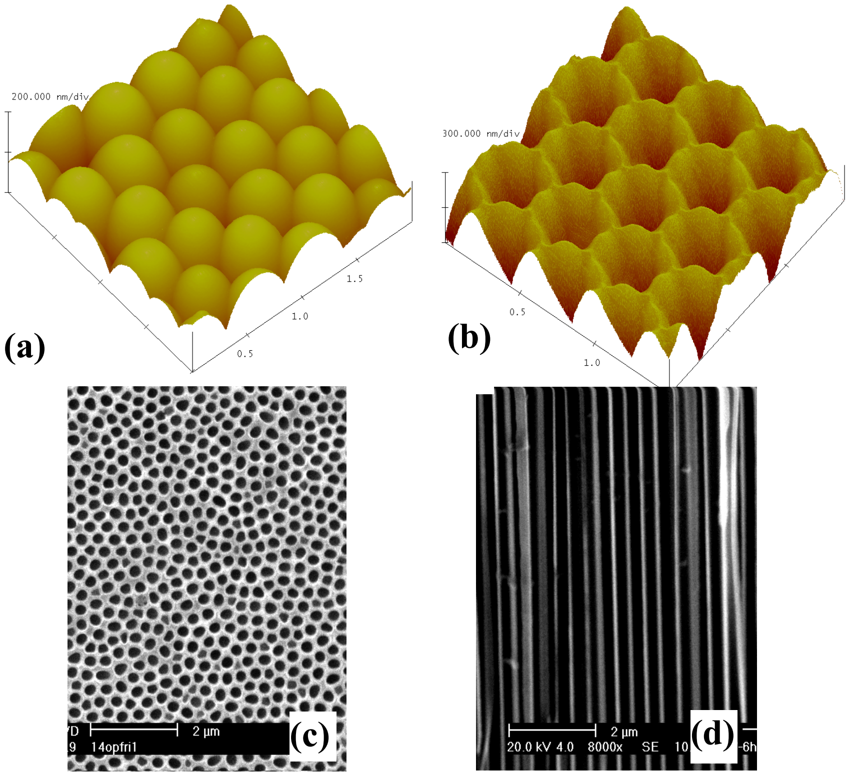


**Figure S6**. (a) Barrier side (2×2 $\mu m^2$) and (b) front side (1.5×1.5 $\mu m^2$) AFM surface topography, (c) front side and (d) cross-sectional SEM micrographs, of phosphoric acid anodized porous alumina after 3rd anodization.