

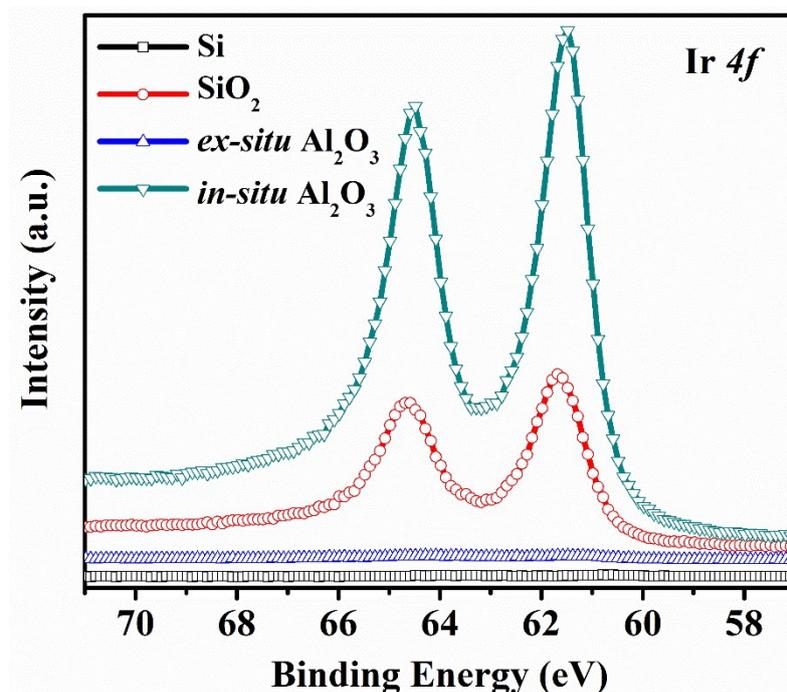
# **Growth behavior of Ir metal by atomic layer deposition in nanopores of anodic aluminum oxide**

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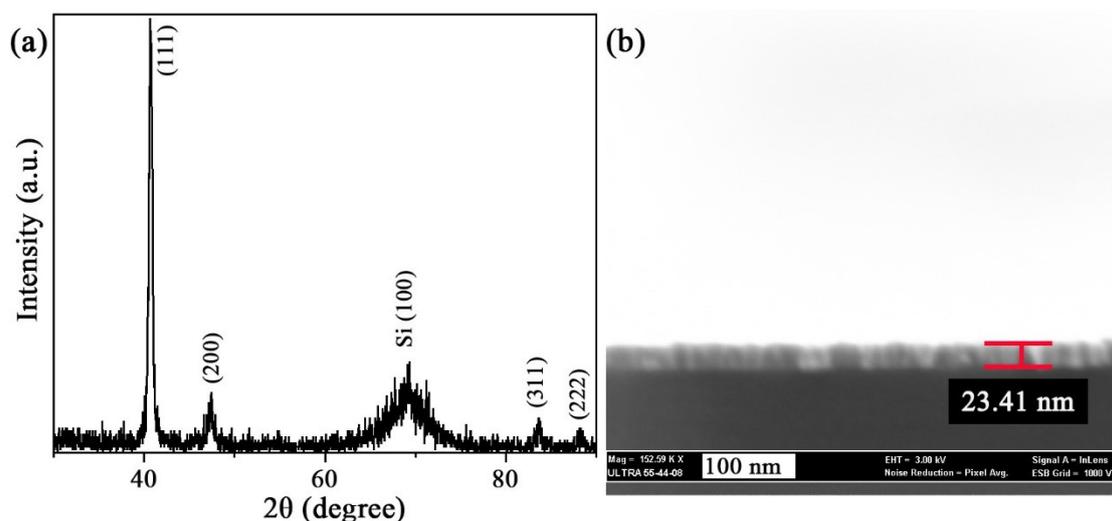
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**Fig. S1** XPS spectra of Ir 4f for 200-cycle ALD Ir on four deposition surfaces of Si substrates.

Ir films on *in-situ* Al<sub>2</sub>O<sub>3</sub> coated Si was detected by XRD after 700 ALD cycles. XRD pattern show prominent peaks at 40.5°, 46.9°, 83.4° and 88.0°, which can be attributed to the (111), (200), (311) and (222) planes of fcc metallic iridium phase (PDF#46-1044).



**Fig. S2** (a) XRD pattern and (b) cross-sectional SEM image after 700-cycle ALD Ir.

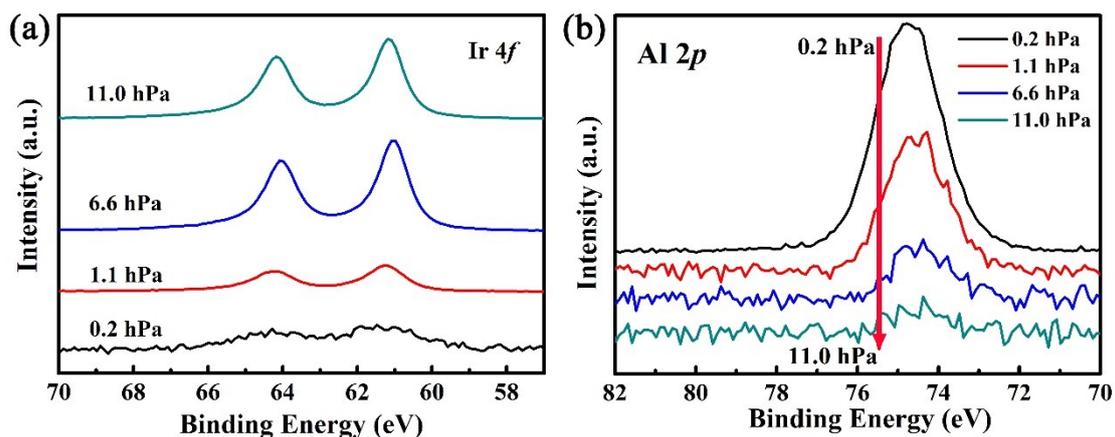


Fig. S3 XPS spectra of (a) Ir 4f, (b) Al 2p with different O<sub>2</sub> partial pressures.

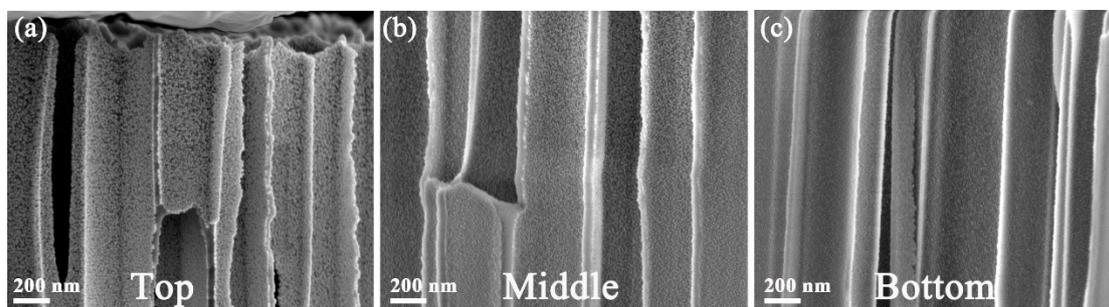


Fig. S4 SEM images of Ir nanoparticles with 12 s/40 s Ir precursor pulse/purge time at the (a) top, (b) middle, and (c) bottom of coated areas.

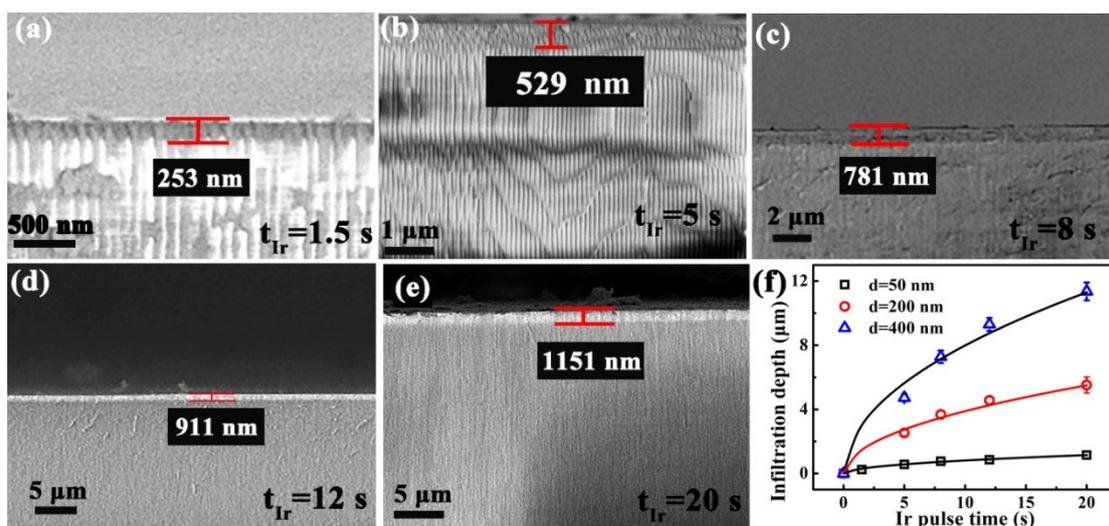
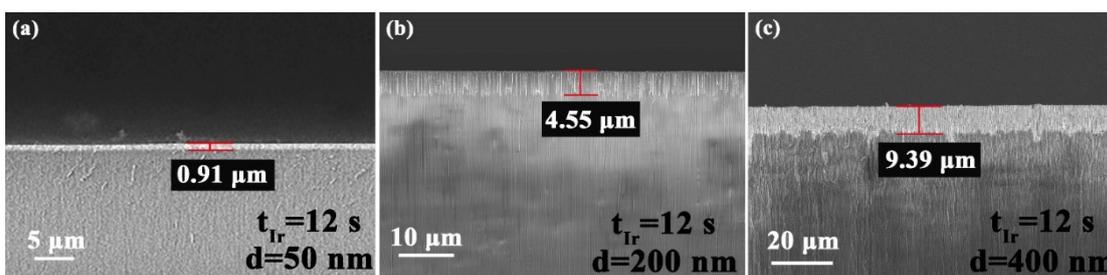
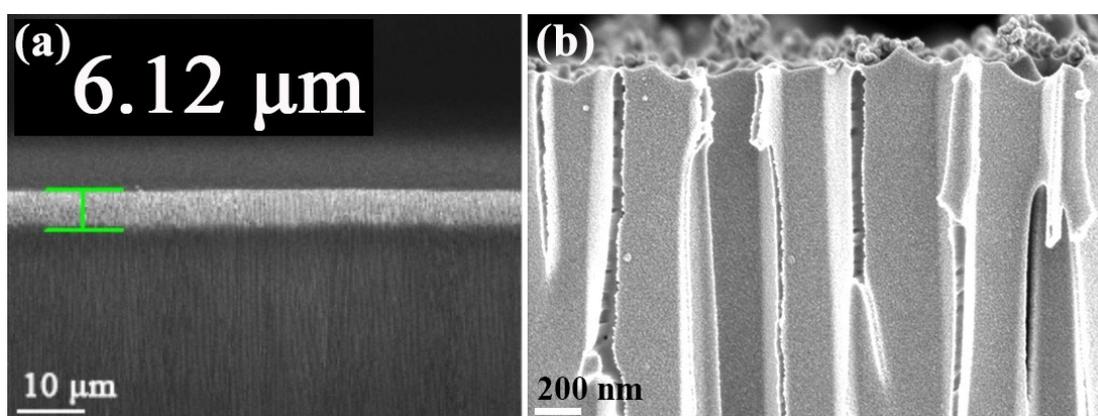


Fig. S5 Cross-sectional SEM images of ALD Ir coated 50 nm-AAO with various Ir precursor pulse time of (a) 1.5 s, (b) 5 s, (c) 8 s, (d) 12 s, and (e) 20 s. (f) Infiltration depth in AAO with different diameters as a function of Ir precursor pulse time.



**Fig. S6** Cross-sectional SEM images of Ir (Ir source pulse time = 12 s) coated AAO with the pore diameter of (a) 50 nm, (b) 200 nm, and (c) 400 nm.



**Fig. S7** (a) Cross-sectional SEM image of 200 cycles Ir films with 12/20 s Ir precursor pulse/purge time in 400-nm-AAO-100  $\mu\text{m}$ . (b) Morphology of Ir film near the entrance with higher magnification.