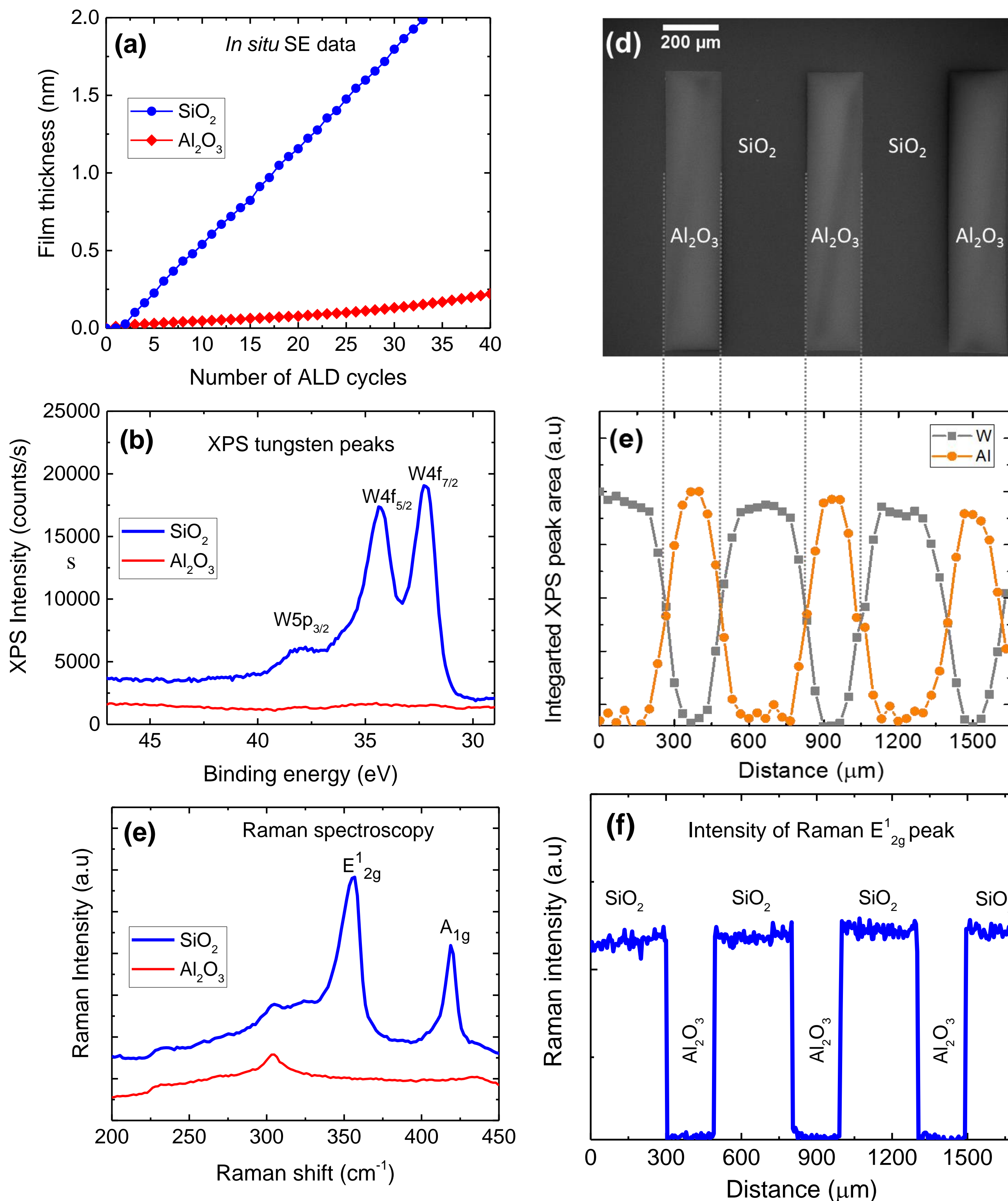

Figure 1 (a) Film thickness of WS_2 on SiO_2 (blue circles) and WS_x films on Al_2O_3 (red diamonds) as a function of number of ALD cycles, as determined from *in-situ* spectroscopic ellipsometry (SE). (b) X-ray photoelectron spectroscopy (XPS) peak intensity of tungsten after 20 ALD cycles on SiO_2 (blue) and Al_2O_3 (red). (c) Raman spectra showing the characteristic in-plane (E^1_{2g}) and out-of-plane (A_{1g}) Raman modes of WS_2 on SiO_2 after annealing at 400°C. (d) Scanning electron microscopy (SEM) images of WS_2 deposited with 20 ALD cycles on SiO_2 with patterned Al_2O_3 on top. (e) XPS elemental W and Al line scans and (f) the corresponding Raman E^1_{2g} peak intensity line scans of the patterns in figure (d).