Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

SUPPORTING INFORMATION

The low temperature atomic layer deposition of ruthenium and the effect of oxygen exposure conditions

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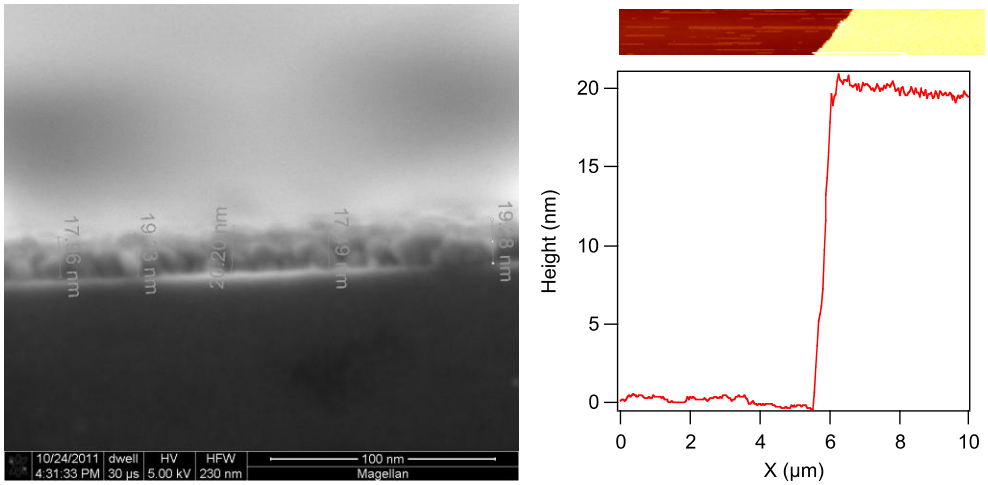

Figure S - 1 Thickness measurement by SEM and AFM of the 1500 ALD cycles ruthenium film deposited on SiO_2 at 500 mtorr oxygen exposure

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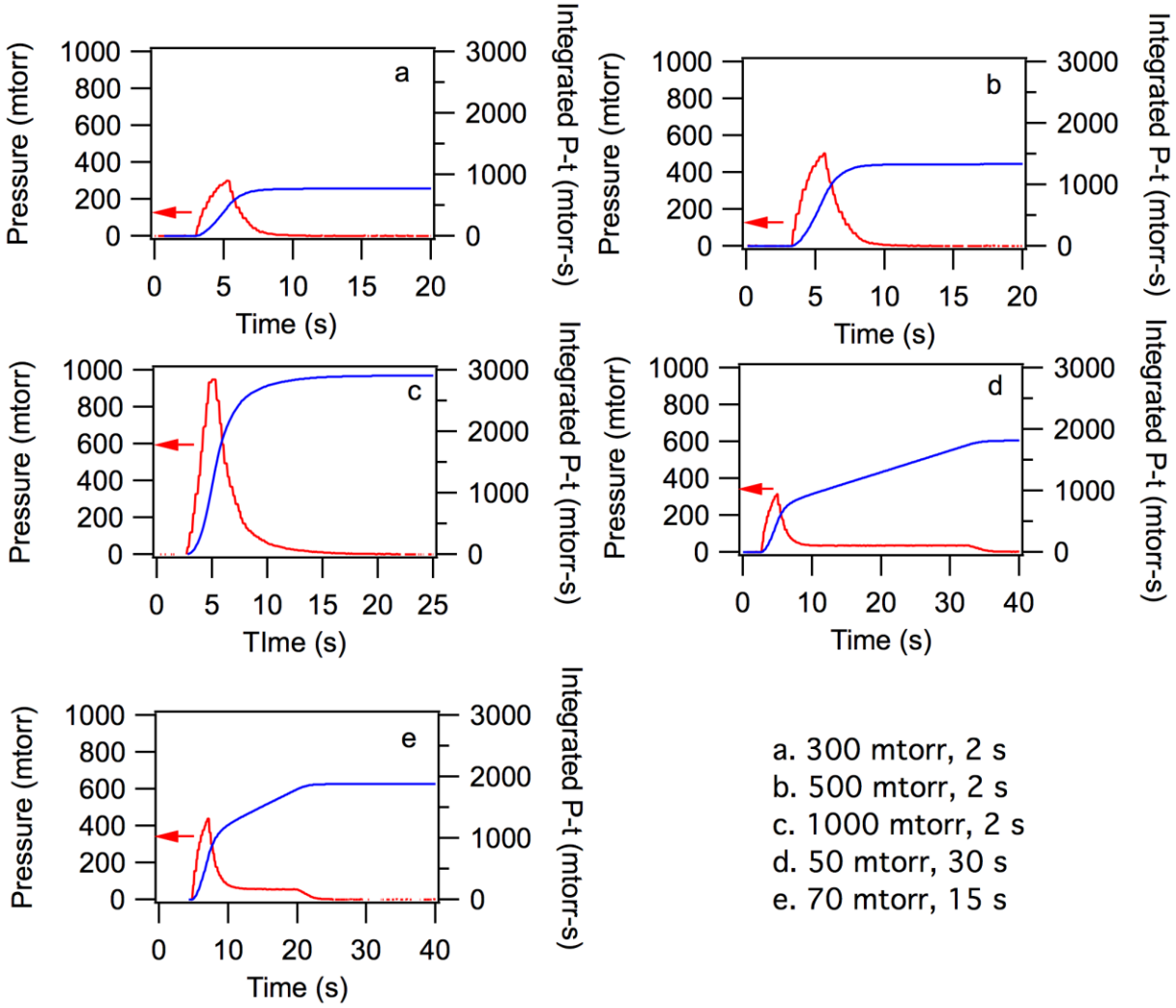

Figure S - 2 Oxygen pressure and integrated pressure-time of oxygen in the chamber during oxygen the half cycle at different oxygen exposure conditions: (a) 300 mtorr, 2 s (b) 500 mtorr, 2s (c) 1000 mtorr, 2s (d) 50 mtorr, 30 s (e) 70 mtorr, 15 s. The pressure in the chamber as a function of time is shown in red and the integrated pressure-time is shown in blue.

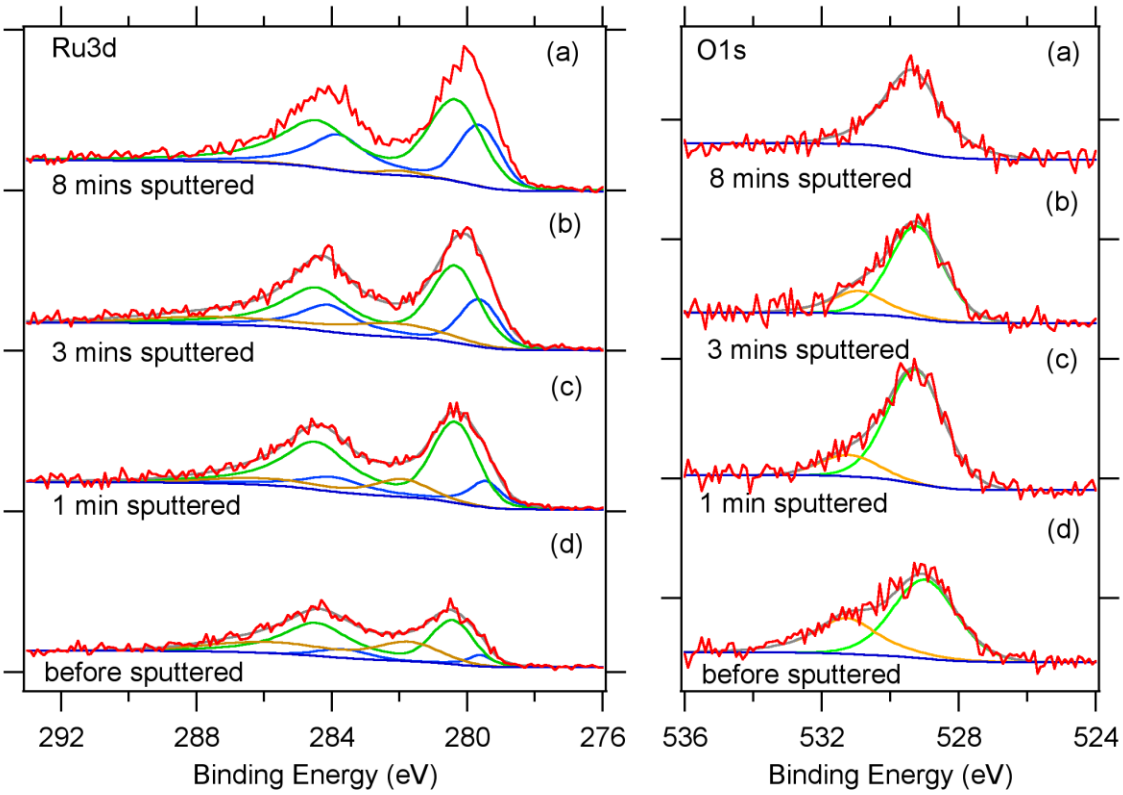

Figure S - 3 The composition of the ruthenium film deposited with 30 s of 50 mtorr oxygen as sputtered at different time. The red line represents the XPS spectra as collected. The blue, green, and yellow lines in the Ru 3d spectra (left) represent the metallic ruthenium, low oxidation state ruthenium oxide and high oxidation state ruthenium oxide, respectively. The same color scheme is applied for the oxygen associated with each ruthenium state in O 1s spectra.