Composite WO_3/TiO_2 nanostructures for high electrochromic activity

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Supporting Information

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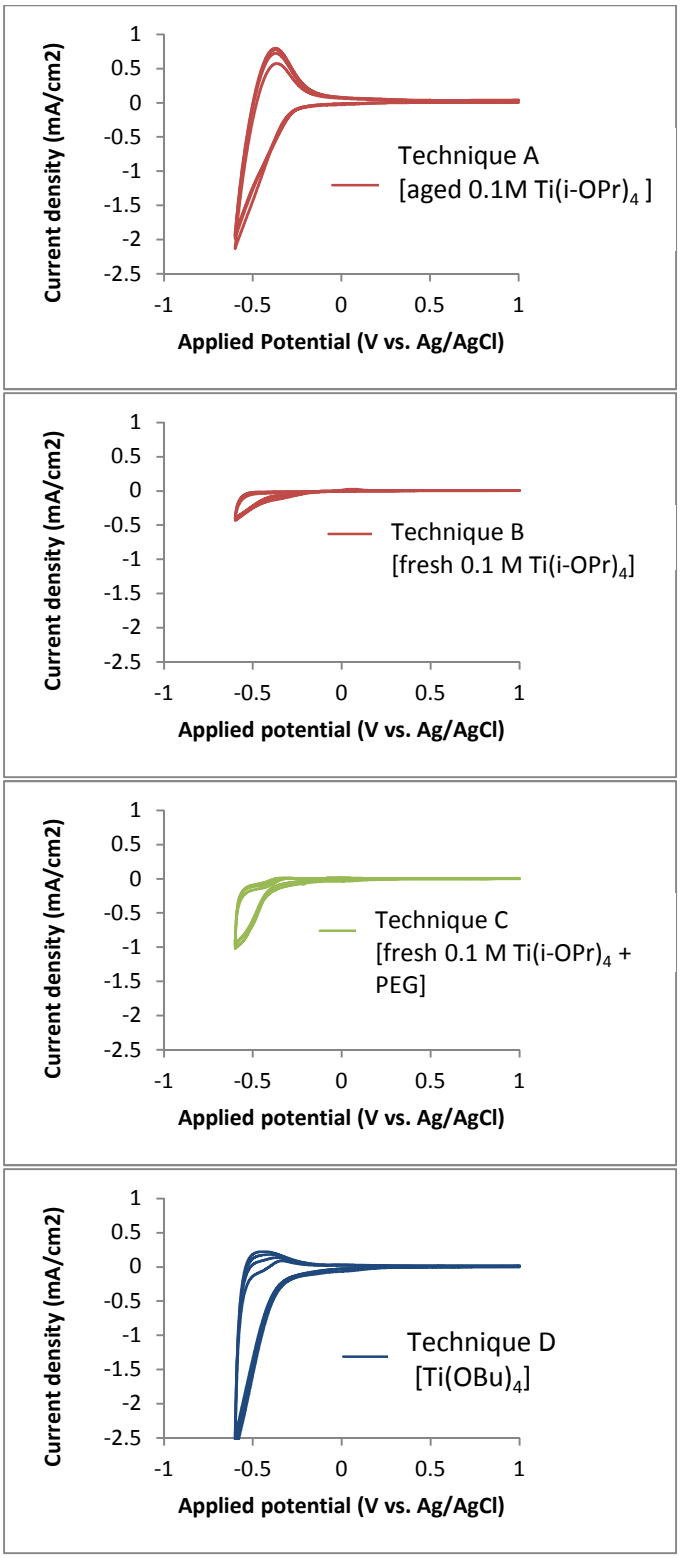

Current density (mA/cm2)
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-1
-0.5
0
0.5
1
Applied Potential (V vs. Ag/AgCl)
Technique A
[aged 0.1M Ti(i-OPr)4]
Current density (mA/cm2)
Applied potential (V vs. Ag/AgCl)
Technique B
[fresh 0.1 M Ti(i-OPr)4]
Current density (mA/cm2)
Applied potential (V vs. Ag/AgCl)
Technique C
[fresh 0.1 M Ti(i-OPr)4 +
PEG]
Current density (mA/cm2)
Applied potential (V vs. Ag/AgCl)
Technique D
[Ti(OBu)4]

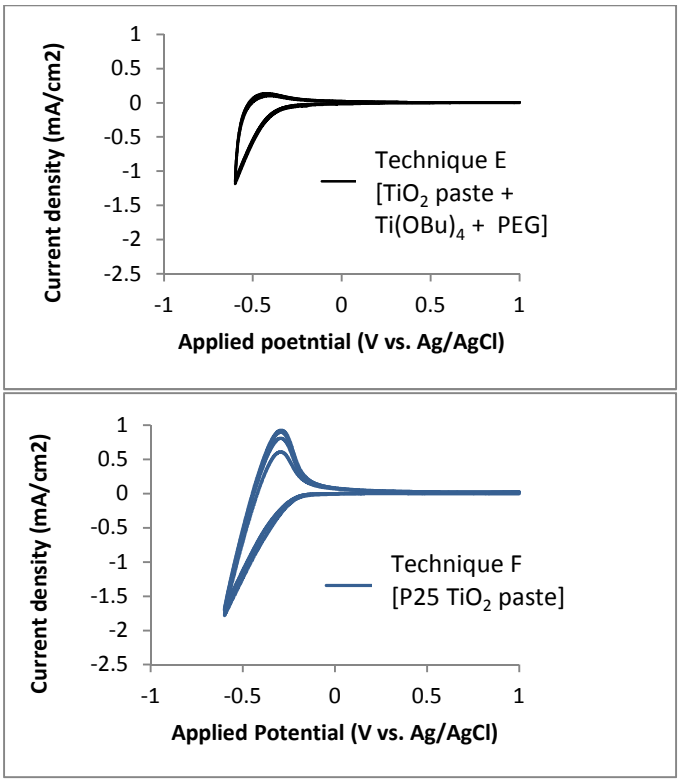
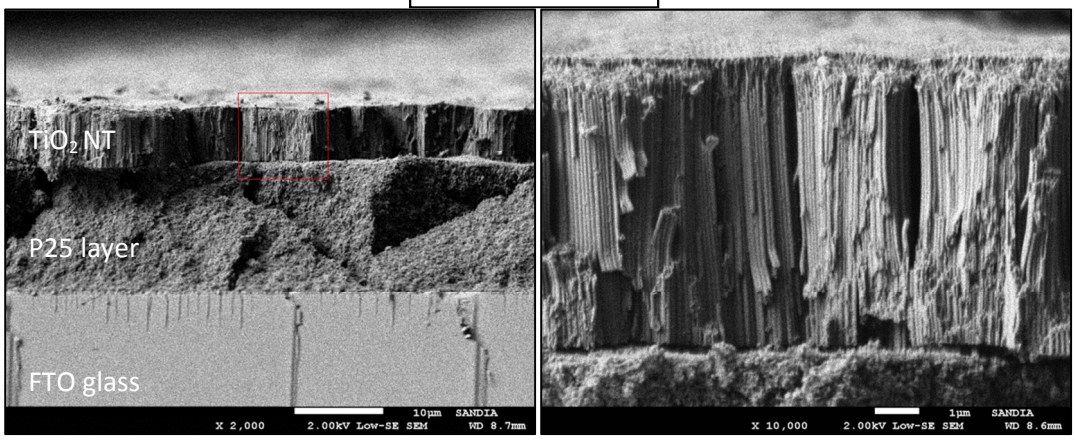
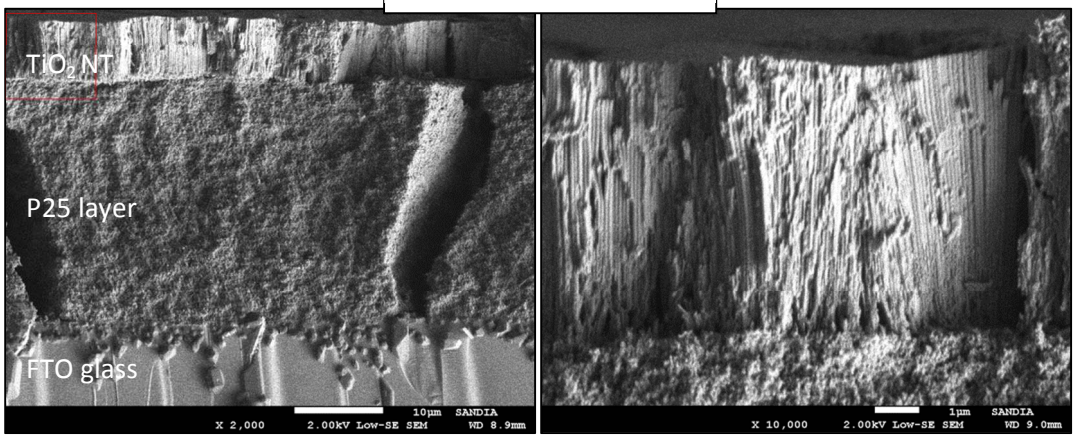


Figure S1: 3-cycle CV of TiO_2 NTs on glass between 1 V to -0.6 V vs. Ag/AgCl at 40 mV s^{-1} in 0.1 M $HClO_4$. The details for the attachment techniques for each sample are described in Table 1.

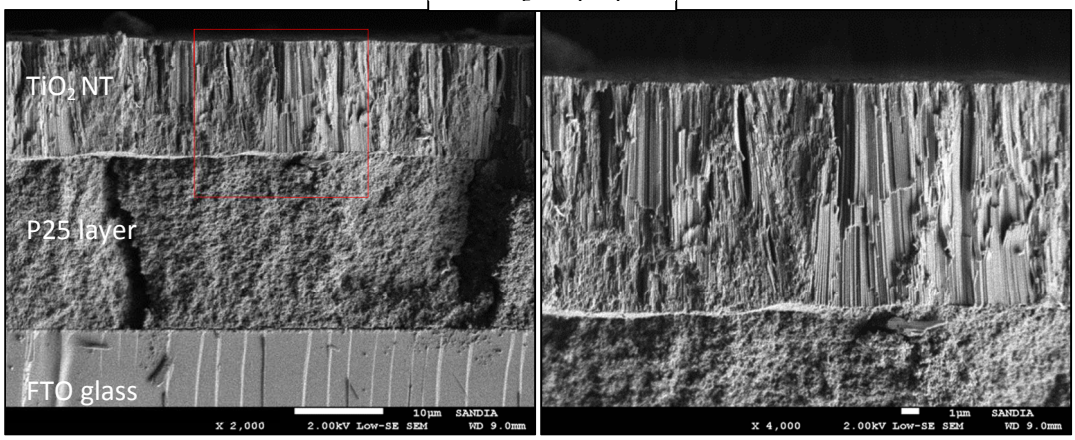
TiO_2 NT (1h)



WO_3/TiO_2 NT (1h)



TiO_2 NT (2h)



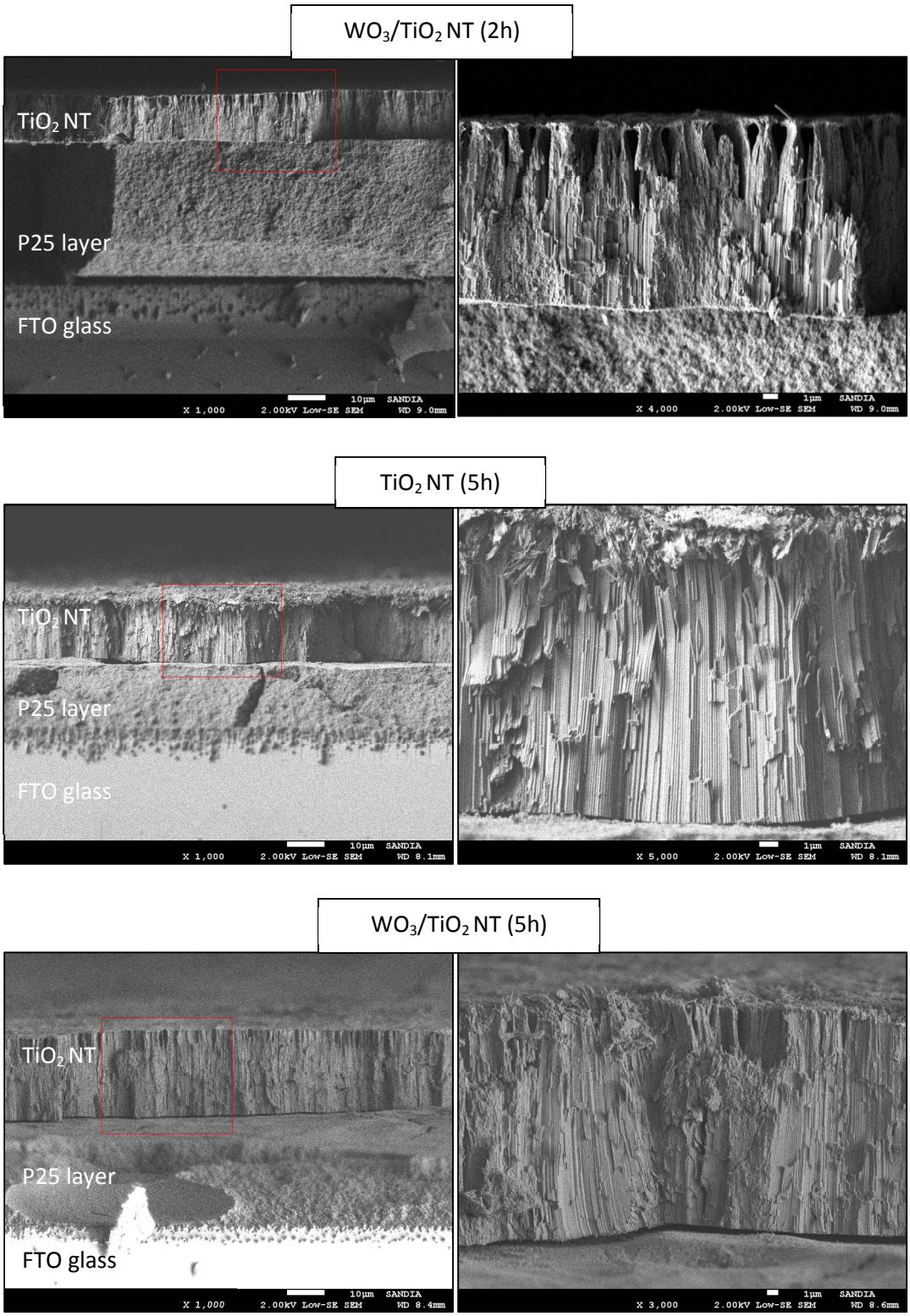
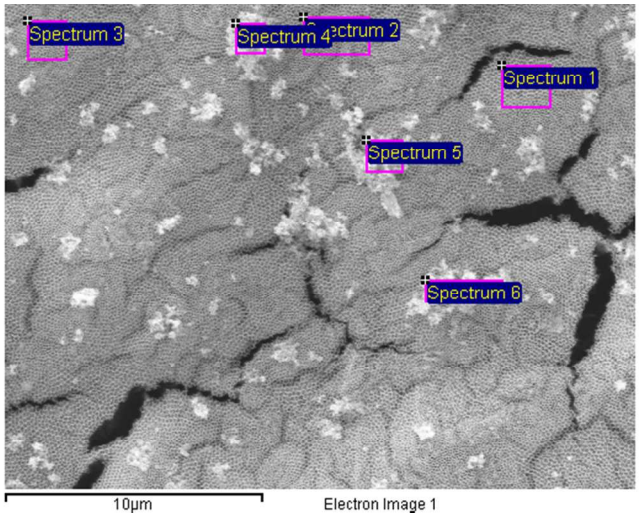
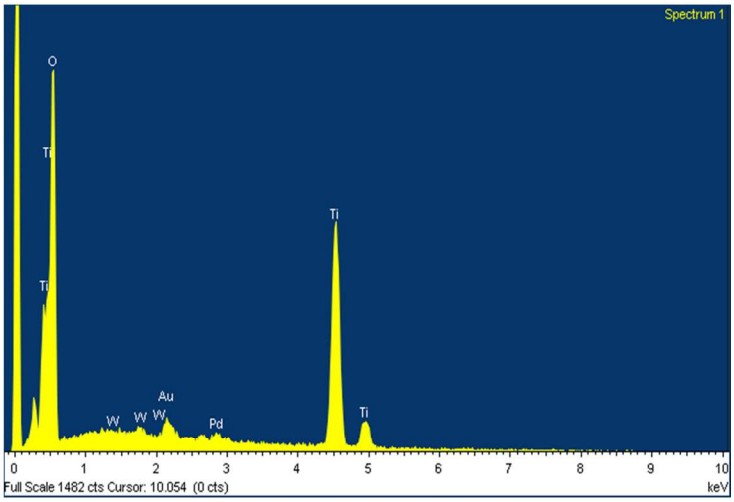


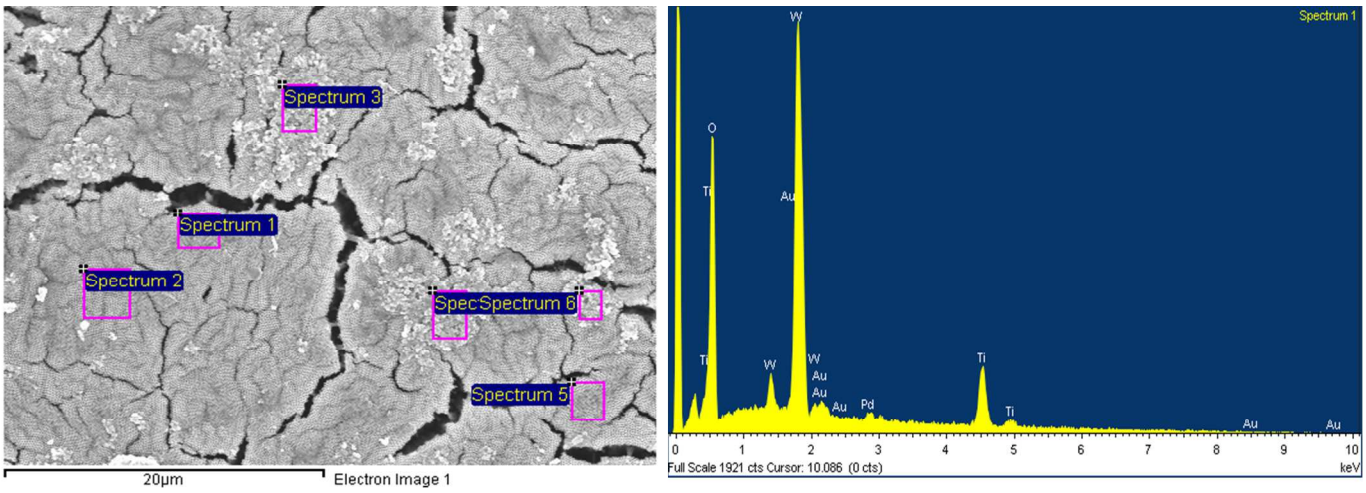
Figure S2: SEM cross sectional images of TiO_2 NT membrane on P25 layer/FTO glass. Magnification and scale bar were (left) 2,000x and 10µm and (right) 10,000x and 1 µm, respectively. Red rectangle in the left image represents the zoom area in the right image.





TiO_2 (2h)	O	Ti	W
spectrum 1	71.47	28.49	0.04
spectrum 2	70.33	29.6	0.07
spectrum 3	71.46	28.52	0.03
spectrum 4	74.02	25.95	0.03
spectrum 5	73.45	26.49	0.06
spectrum 6	74.98	25.01	0.01
spectrum 7	72.32	27.66	0.03
spectrum 8	72.15	27.79	0.06
spectrum 9	74.07	25.91	0.02
spectrum 10	72.94	27.03	0.03
spectrum 11	68.2	31.73	0.08
spectrum 12	73.19	26.8	0
average	72	28	0.04
std. deviation	2	2	0.02

Figure S3: SEM plan-view images of TiO_2 NT membranes on FTO glass. The rectangles indicate the locations where the EDS was measured. The table summarizes the atomic percentages (at. %) of the main elements found in the EDS spectra for each spectrum.



WO_3/TiO_2 (2h)	O at %	Ti at %	W at %
spectrum 1	73.35	13.81	12.84
spectrum 2	71.25	15.56	13.19
spectrum 3	74.17	15.29	10.54
spectrum 4	73.39	15.89	10.72
spectrum 5	72.48	14.19	13.33
spectrum 6	73.37	15.53	11.1
spectrum 7	72.65	13.66	13.7
spectrum 8	73.25	13.85	12.91
spectrum 9	72.02	14.64	13.34
spectrum 10	74.92	14.37	10.71
spectrum 11	73.36	14.6	12.04
spectrum 12	74.52	14.65	10.83
average	73	15	12
std. deviation	1	1	1

Figure S4: SEM plan-view images of WO_3/TiO_2 NT membranes on FTO glass. The rectangles indicate the locations where the EDS was measured. The table summarizes the atomic percentages (at. %) of the main elements found in the EDS spectra for each spectrum.

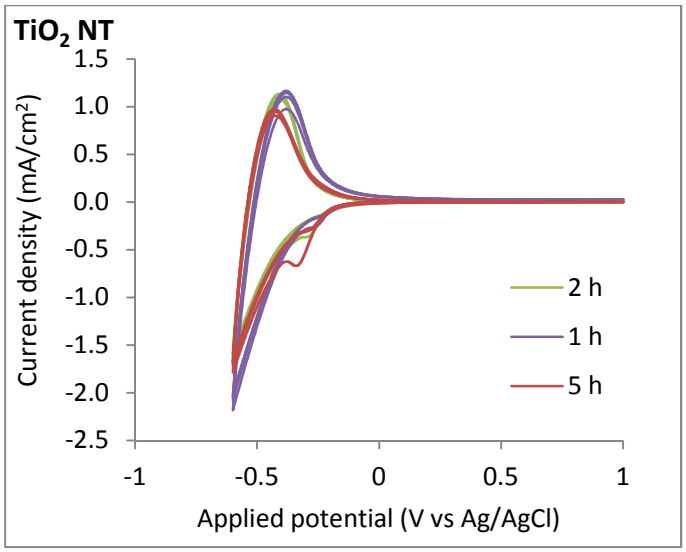


Figure S5: CV of TiO_2 nanotubes (on foil) with different anodization times. All samples were tested in 0.1 M $HClO_4$ electrolyte solution at a scan rate of 40 mV s^{-1}.

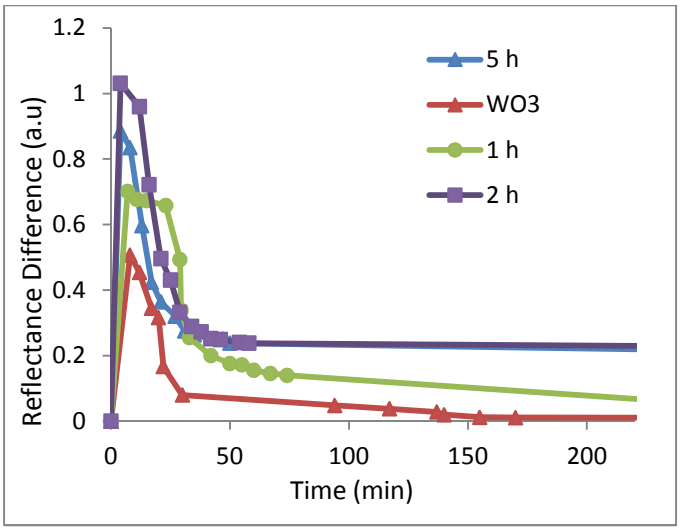


Figure S6: Reflectance difference vs. time at 600 nm with data points taken after a CV experiment scanning from 1 V to -0.6 V at 40 mV s^{-1} in 0.1 M $HClO_4$ electrolyte solution. A spectrum taken at much longer times leads to the extension of each curve to the right edge of the plot.