

# Composition and Properties of RF-Sputter Deposited Titanium Dioxide Thin Films – Supplementary Materials

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current	current/1.6	area (cm <sup>2</sup> )	dose	time (seconds)	Time (minutes)
1.30E-07	8.13E+11	1	6.00E+14	7.38E+02	12.31
1.40E-07	8.75E+11	1	6.00E+14	6.86E+02	11.43
1.50E-07	9.38E+11	1	6.00E+14	6.40E+02	10.67
1.60E-07	1.00E+12	1	6.00E+14	6.00E+02	10.00
1.70E-07	1.06E+12	1	6.00E+14	5.65E+02	9.41
1.80E-07	1.13E+12	1	6.00E+14	5.33E+02	8.89
1.90E-07	1.19E+12	1	6.00E+14	5.05E+02	8.42
2.00E-07	1.25E+12	1	6.00E+14	4.80E+02	8.00
2.10E-07	1.31E+12	1	6.00E+14	4.57E+02	7.62

Table S1 Sputter dose calculations for a range of Argon ion currents, determining the required exposure time to receive the specified sputter dose

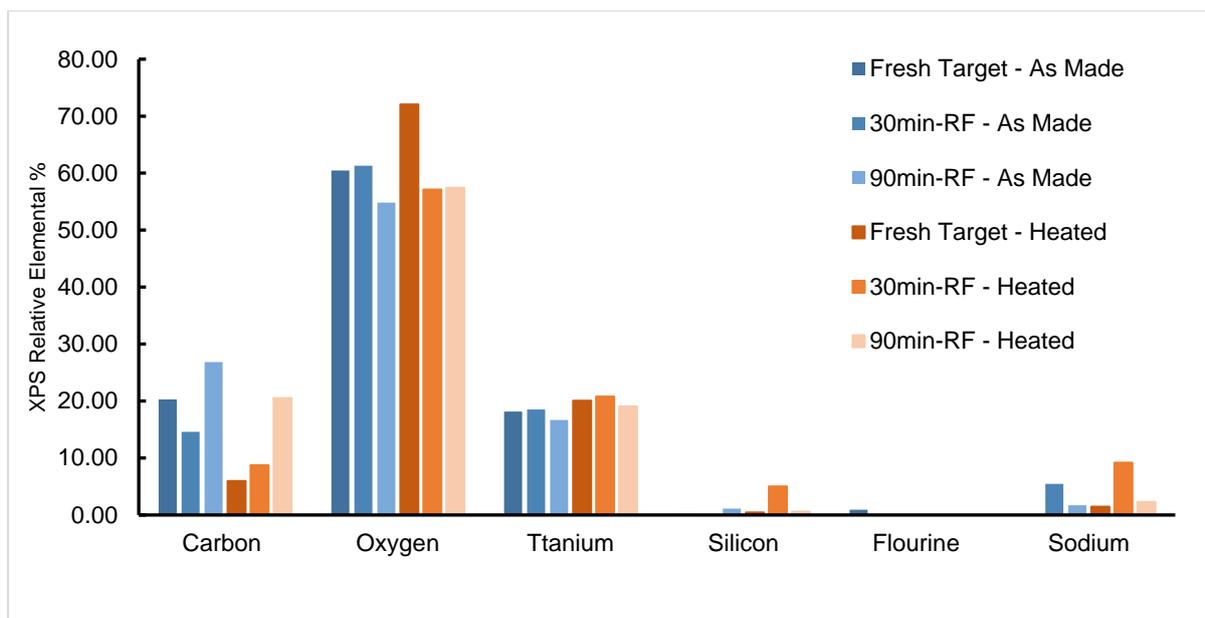


Figure S1 XPS relative elemental composition comparison between the as-prepared and heated RF sputter samples

Table S2: Analysis of an XP Spectra from FT-RF TiO<sub>2</sub> in as made condition, showing the energy peak positions, FWHM and intensities found in each region scanned (No Na was found in this sample). These values are typical for such a sample.

Name	Peak Position (Calibrated)	Area	Relative Concentration (%)
Carbon 1s	285	28823.9	21.5
Carbon 1s	286.7	4304.2	3.2
Carbon 1s	288.9	1795.8	1.3
Oxygen 1s	530.3	147337.8	45.7
Oxygen 1s	531.7	22609.5	7.0
Oxygen 1s	532.6	6667.5	2.1
SiO <sub>2</sub> 2p	101.4	486.6	0.3
SiO <sub>2</sub> 2p	102.4	321.2	0.2
Titanium 2p 4+	458.8	111379.5	12.3
Titanium 2p 3+	464.5	53309.8	5.9
Fluorine	684.6	3177.4	0.7
Total			100

Table S3: Analysis XPS taken from a sample of Single Crystal (SC) Rutile  $\text{TiO}_2$  after argon sputtering and heating to  $625^\circ\text{C}$  under vacuum. This sample served as an ideal  $\text{TiO}_2$  reference.

Species Name	Peak Position (Calibrated)	Area	Relative Concentration (%)
Carbon 1s	285	985.1	1.2
Carbon 1s	286.7	256.9	0.3
Carbon 1s	289.2	112.9	0.1
Titanium 2p 4+	459.2	86766.1	22.4
Titanium 2p 3+	457.5	3846.3	1.0
Titanium 2p 2+	456.5	1192.3	0.34
Oxygen 1s	530.5	133731	66.64
Oxygen 1s	532.0	15410.2	7.7
SiO 2p	102.1	3846.3	0.4
		Total	100

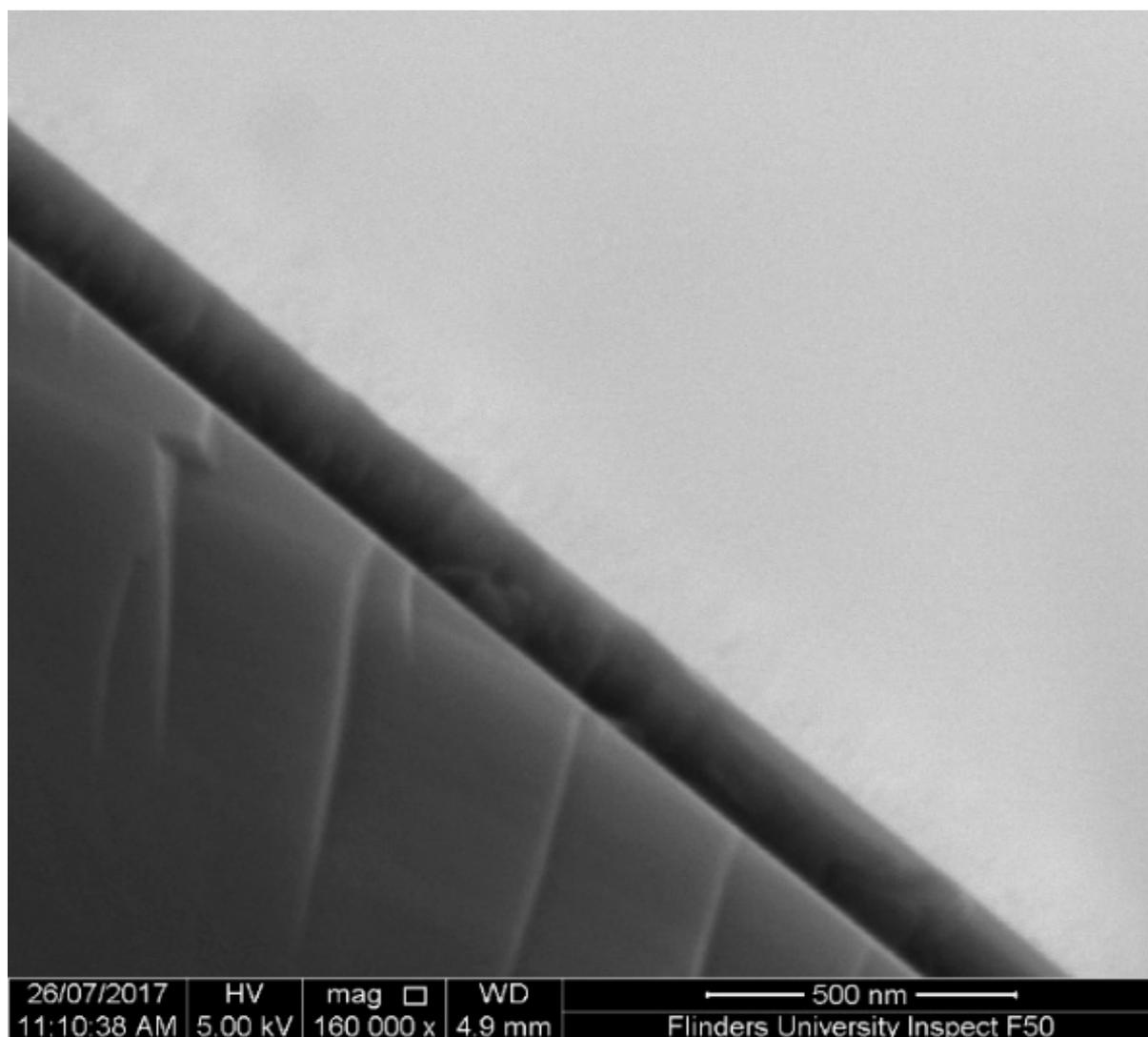
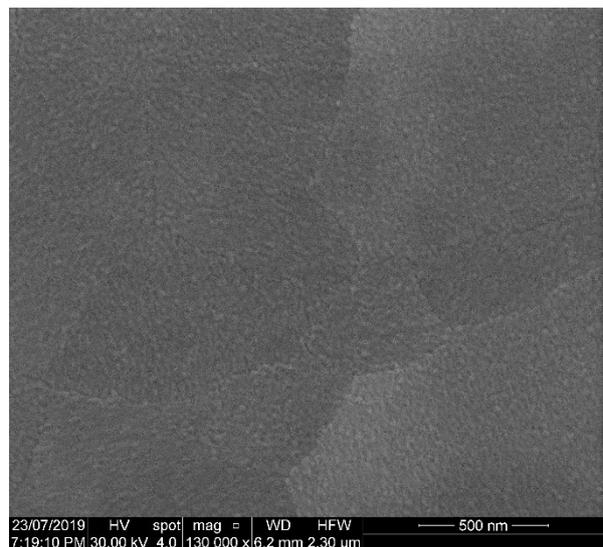
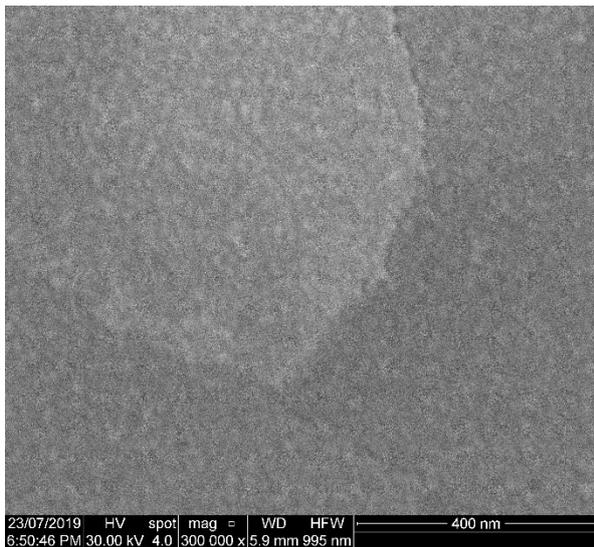
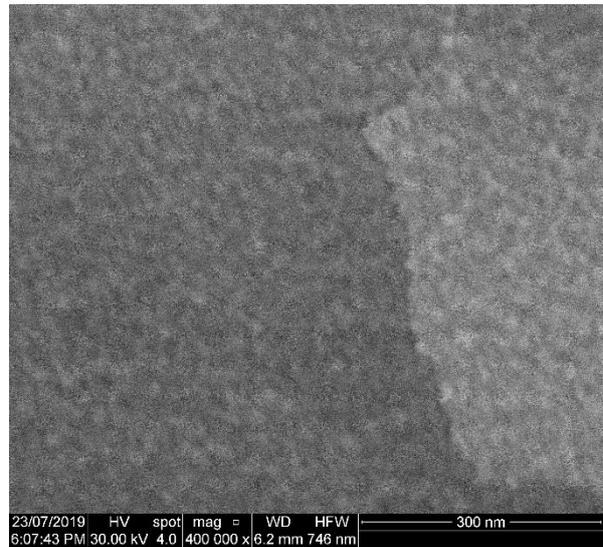
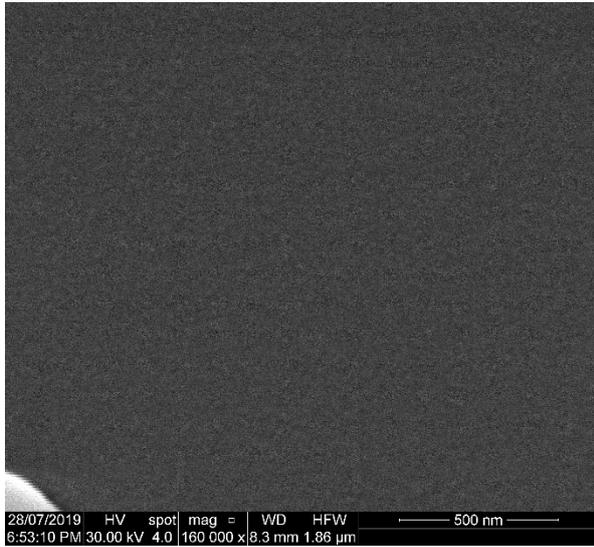


Figure S2 SEM image of 90min-RF-As Made Sample, the arrow indicates  $\text{TiO}_2$  film thickness of approximately 153 nm.



*Figure S3 High magnification SEM scans on RF-TiO<sub>2</sub> after different heat treatments, clockwise from top left: As made, 300°C, 500°C, 700°C showing the transition from smaller, spherical particles on the film surface into aggregation and alignment into larger TiO<sub>2</sub> grains*