Supporting Information

Air-stable Thin Film with High and Anisotropic Electrical Conductivities Composed of Carbon-Centered Neutral π-Radical

Hiroshi Ito,[†] Tsuyoshi Murata,[†] Takahiro Miyata,[†] Miwa Morita,[†]
Ryotaro Tsuji,[*,‡] Yasushi Morita[*,†]

[†] Department of Applied Chemistry, Faculty of Engineering, Aichi Institute of Technology, Toyota, Aichi 470-0392, Japan

[‡] Material Solutions New Research Engine, KANEKA Corporation, Suita, Osaka 565-0871, Japan

Table S1. Summary of the conditions of vapor deposition of **1** on various substrates and deposition rates.

Substrate		SiO_2		ITO	HOPG	graphite sheet	peeled graphite sheet
Amount of **1** loaded in crucible	0.8 mg	1.0 mg	1.0 mg	1.0 mg	1.0 mg	1.0 mg	2.0 mg
Distance from crucible to substrate	30 mm	30 mm	30 mm	30 mm	90 mm	30 mm	30 mm
Vacuum evaporation chamber	VPC-260	KXV-250	KXV-250	VPC-260	VPC-260	VPC-260	VPC-260
Degree of vacuum	$1.7–2.5 \times 10^{-4}$ Pa	$3.1–3.2 \times 10^{-3}$ Pa	$5.6–6.1 \times 10^{-3}$ Pa	$3.1–5.3 \times 10^{-4}$ Pa	$3.3–5.6 \times 10^{-4}$ Pa	$1.7–3.5 \times 10^{-4}$ Pa	$2.4–3.6 \times 10^{-4}$ Pa
Deposition time	60 min	24 min	8 min	10 min	60 min	30 min	100 min
Thickness of film	720 nm [a]	170 nm [b]	280 nm [b]	380 nm [b]	50 nm [b]	430 nm [b]	700 nm [b]
Deposition rate [c]	0.2 Å/s	1.2 Å/s	5.8 Å/s	6.3 Å/s	0.14 Å/s	2.9 Å/s	1.2 Å/s
Orientation type	block and wire like crystals	edge-on	edge-on	edge-on	face-on	face-on	face-on
SEM images in the main text	Fig. 2a	Fig. 2b	Fig. 2c	Fig. 4a	Fig. 4a	Figs. 4b, 4c	Fig. 4d

[a] Thickness measured by the stylus profilometry, since the film surface was roughly covered with wire-like crystals. [b] Thickness measured by the cross-section SEM image. [c] Deposition rate was obtained by dividing the thickness with the deposition time.

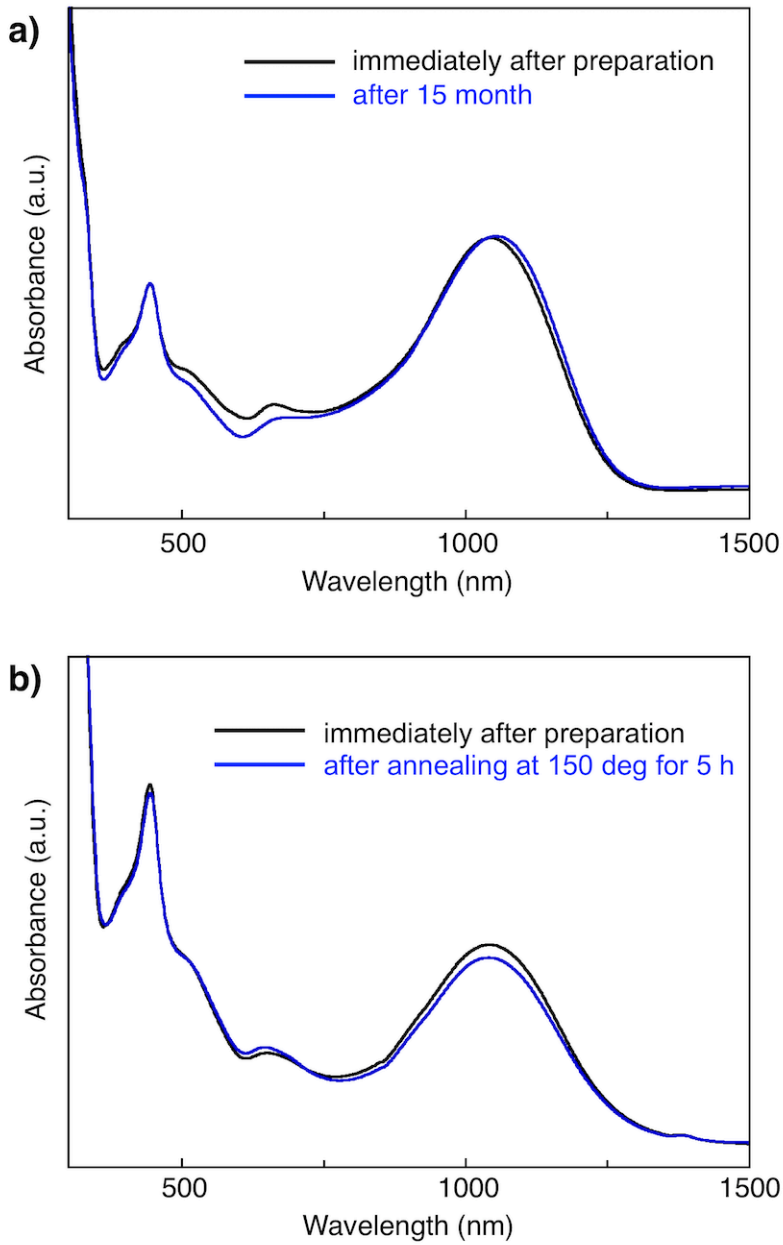

Figure S1. Absorption spectra of thin films of **1** on glass substrate measured in air atmosphere. a) Spectra measured immediately after preparation (black line) and after standing for 15 months under air. B) Spectra measured immediately after preparation (black line) and after annealing at 150 °C for 5 hours in air.

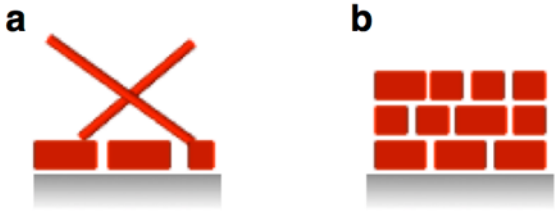

Figure S2. Schematic image of the vapor deposited thin films of **1**. a) low deposition rate, b) high deposition rate.

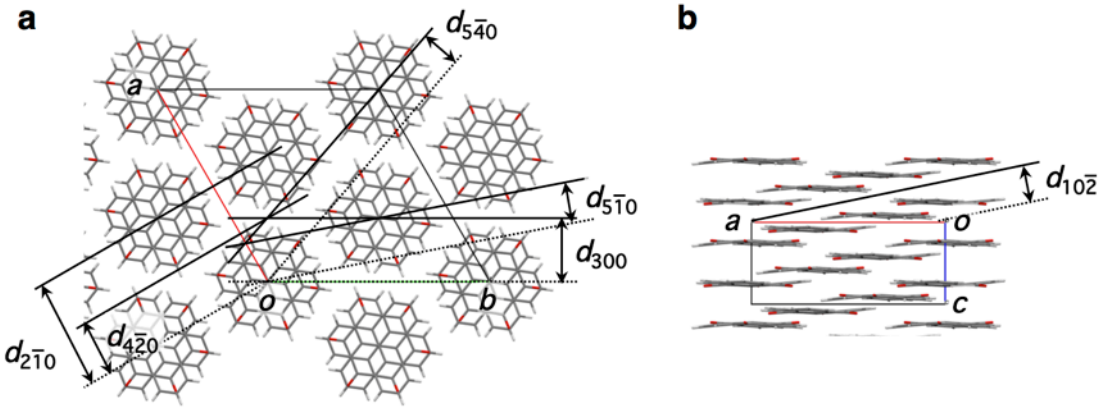

Figure S3. Crystal structure of **1**. Top (a) and side (b) view.

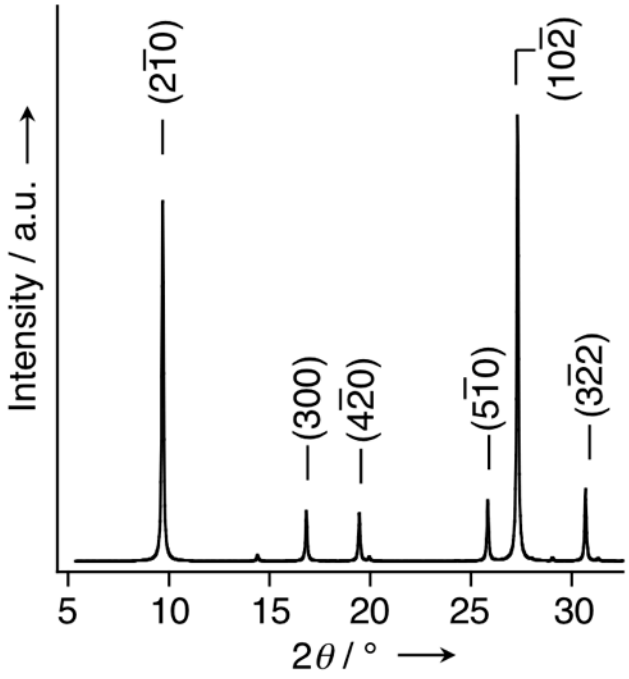

Figure S4. Simulated XRD spectra of **1** from single crystal model.

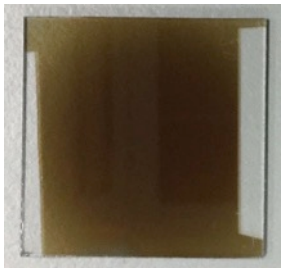

Figure S5. Photograph of a thin film of **1** deposited on a glass substrate.

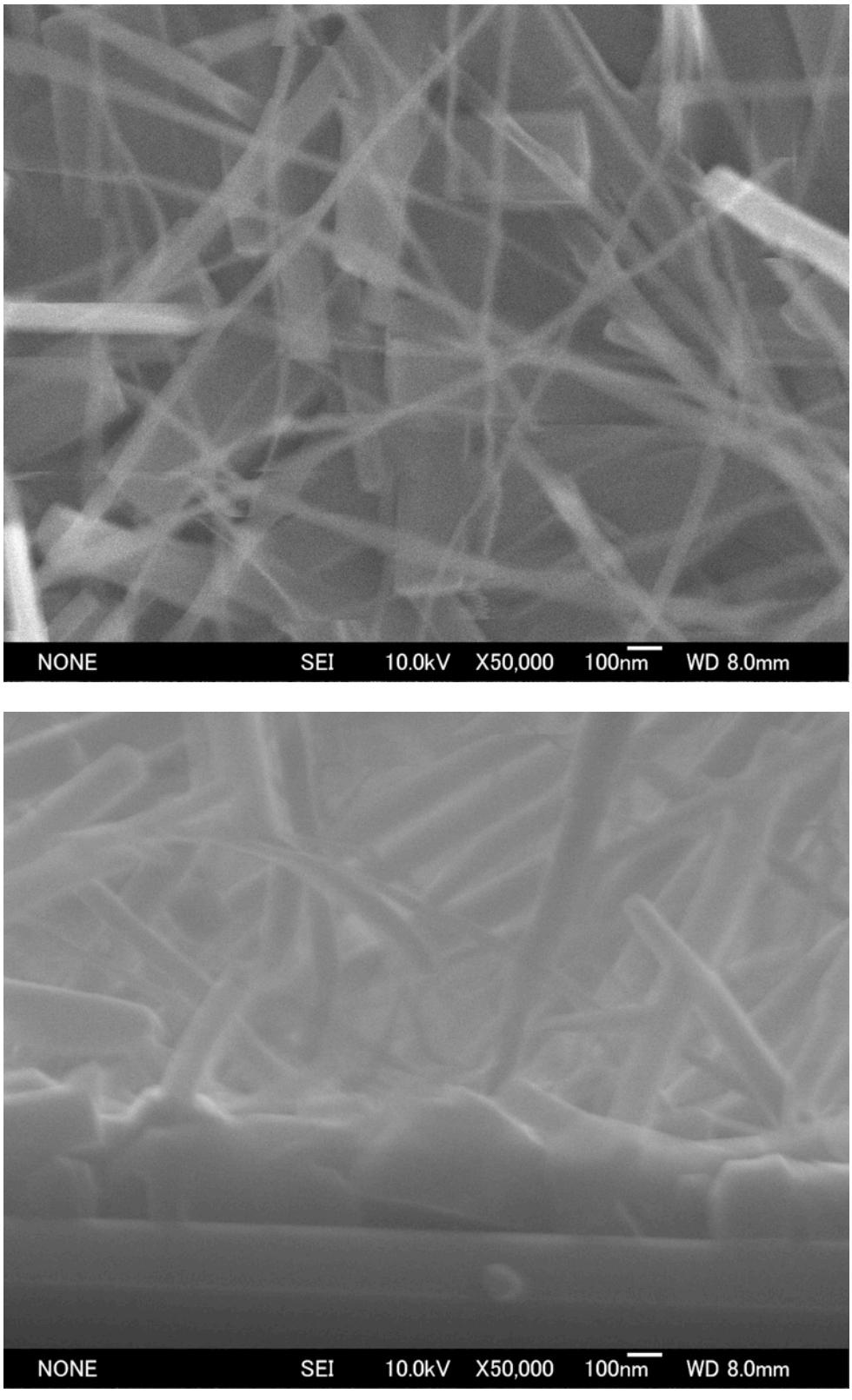

Figure S6. SEM images of a thin film of **1** deposited on a SiO_2 substrate at low rate. Surface (top) and cross section view (bottom).

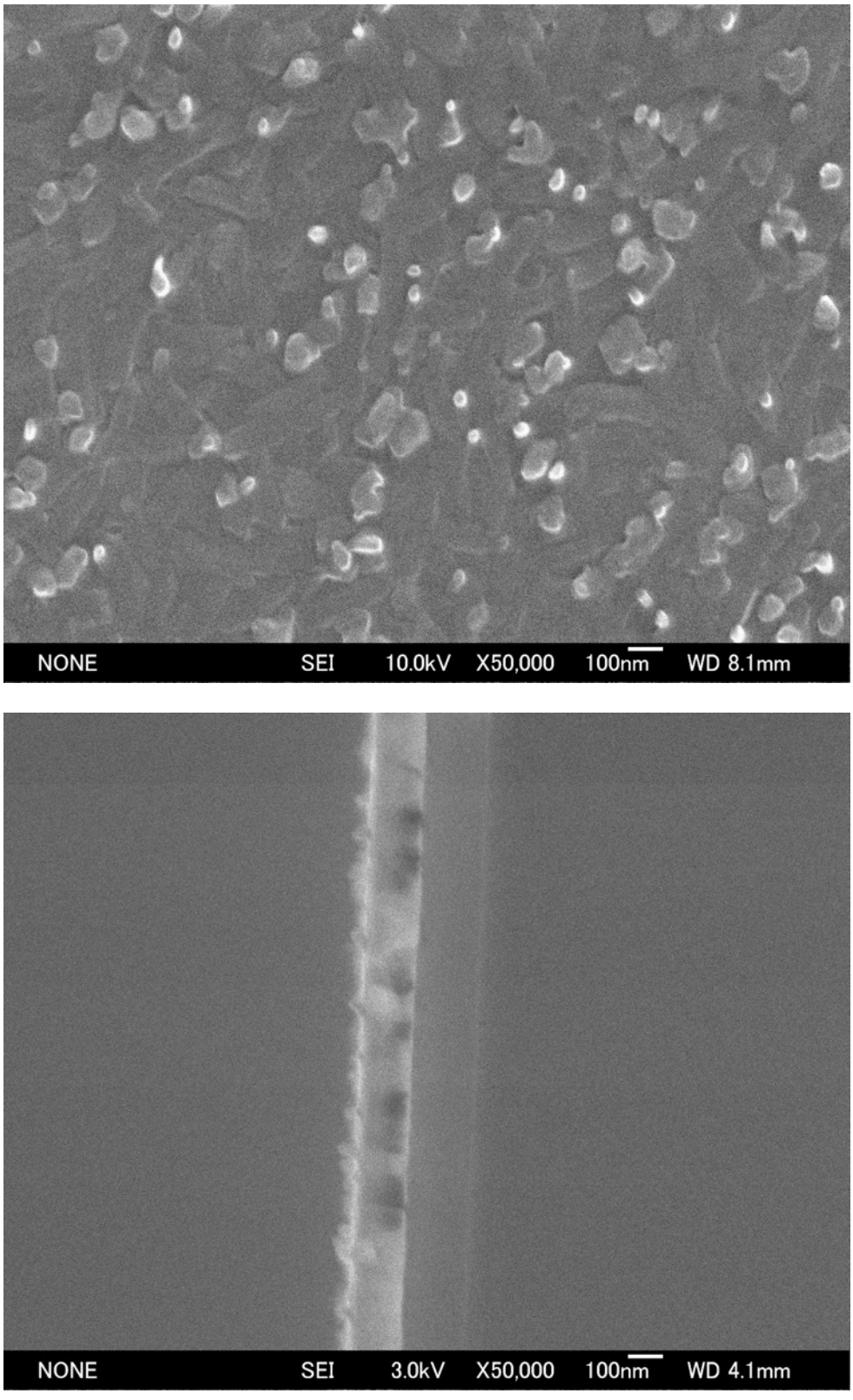

Figure S7. SEM images of a thin film of **1** deposited on a SiO_2 substrate at middle rate. Surface (top) and cross section view (bottom).

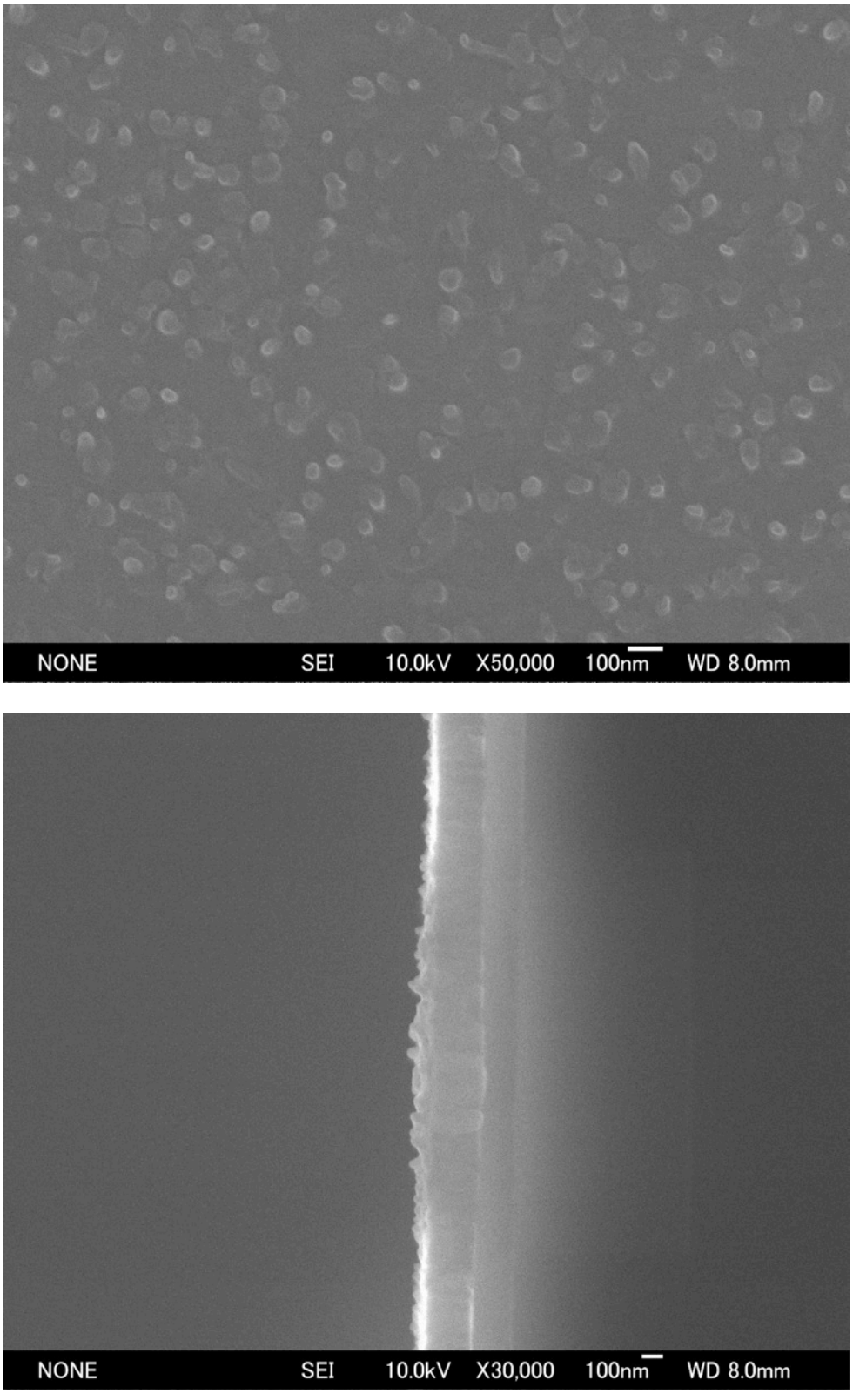

Figure S8. SEM images of a thin film of **1** deposited on a SiO_2 substrate at high rate. Surface (top) and cross section view (bottom).

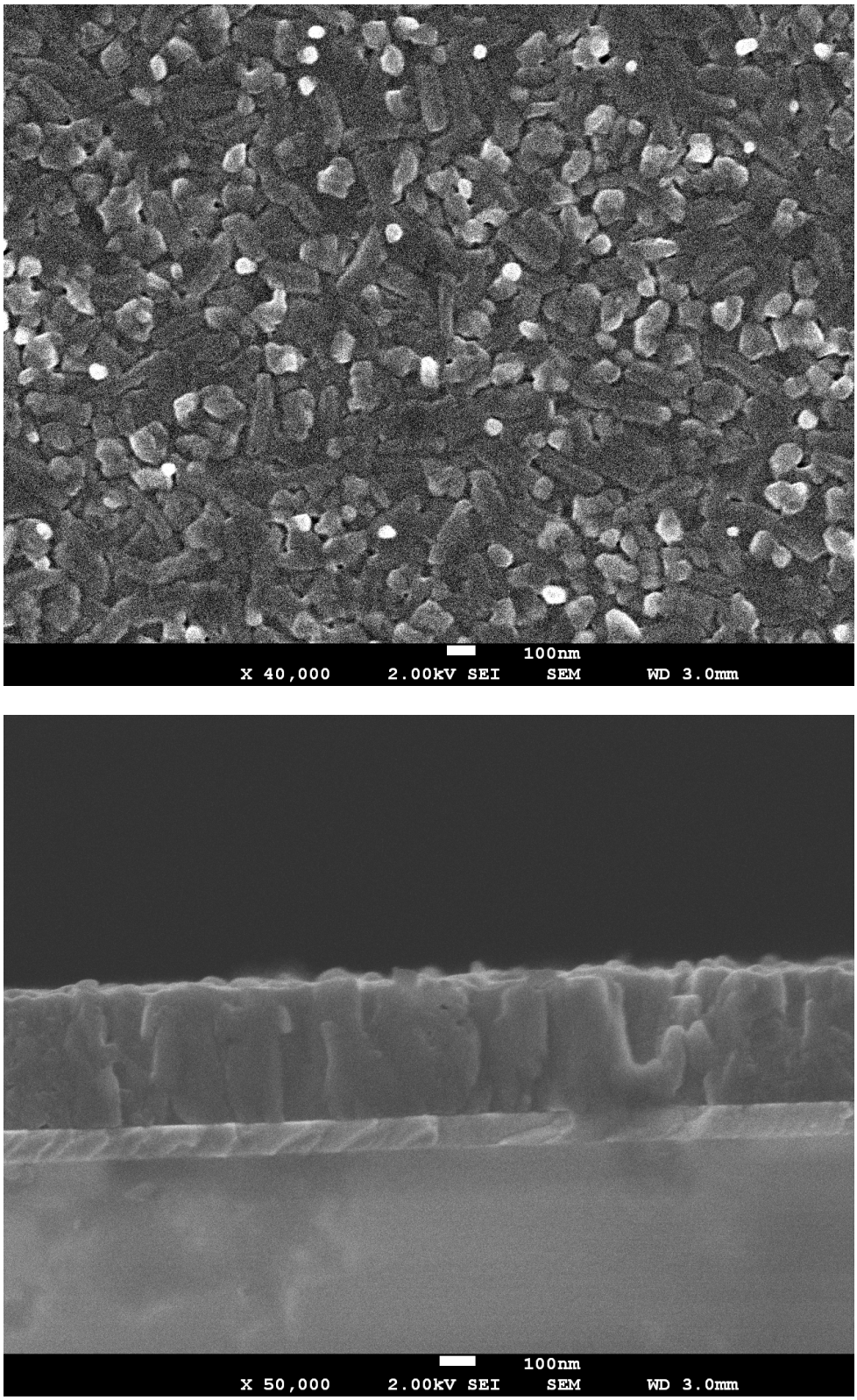

Figure S9. SEM images of a thin film of **1** deposited on an ITO substrate at high rate. Surface (top) and cross section view (bottom).

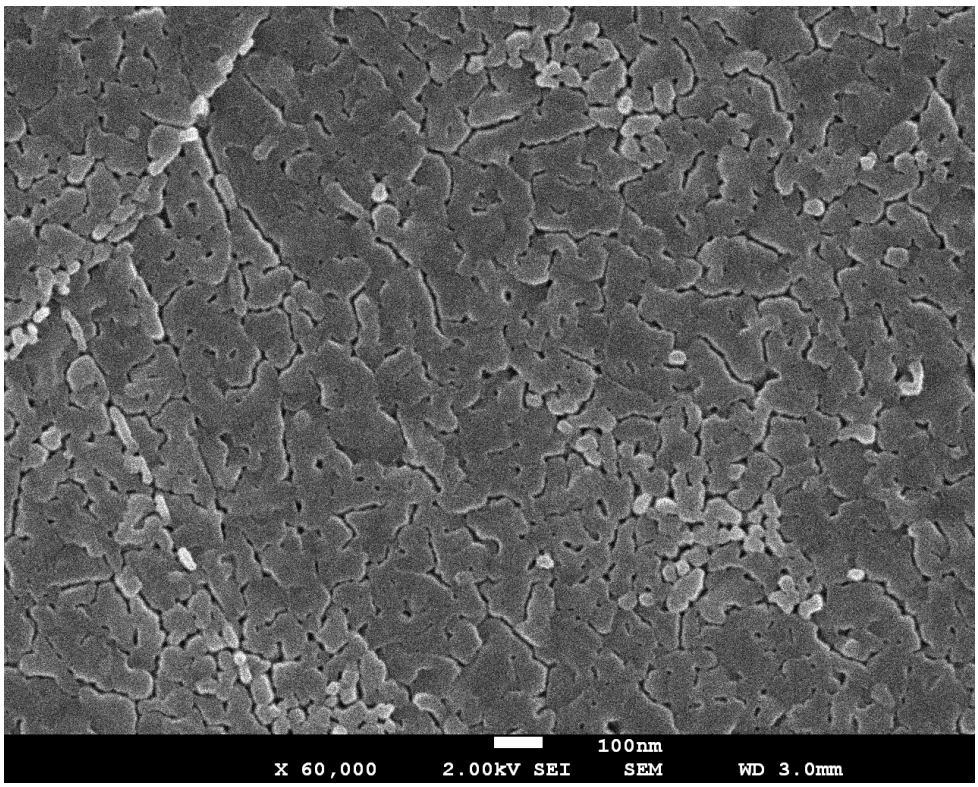

Figure S10. Surface SEM images of a thin film of **1** deposited on an HOPG.

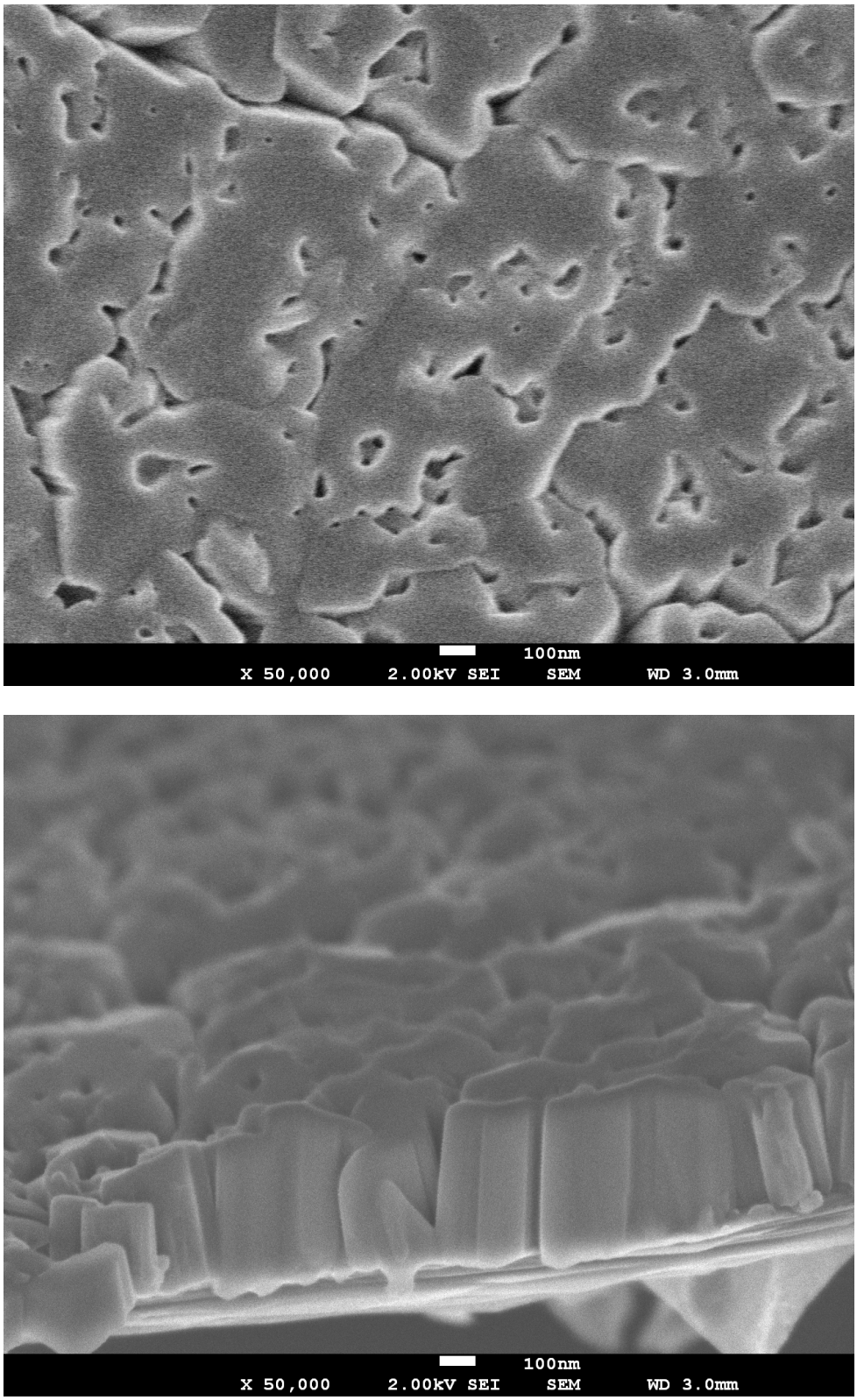

Figure S11. SEM images of a thin film of **1** deposited on a graphite sheet. Surface (top) and cross section view (bottom).

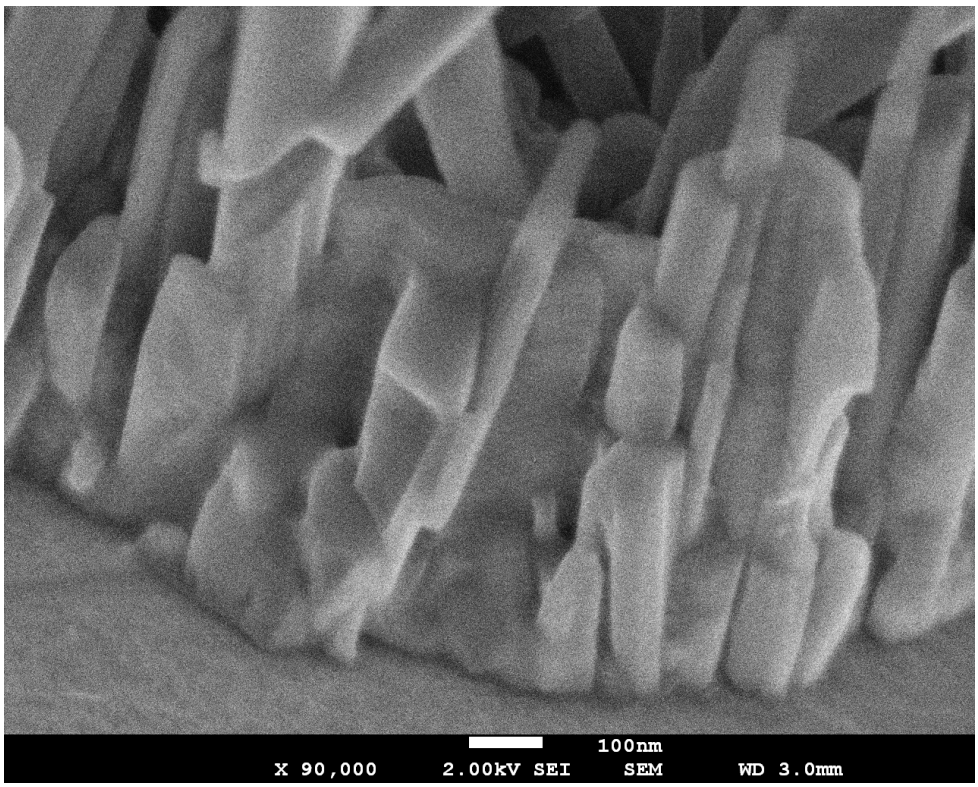

Figure S12. Cross section SEM images of a thin film of **1** deposited on a graphite sheet peeled 24 times with scotch tape.