

Supporting Information

Lowering Contact Resistance by SWCNT-Al Bilayer Electrodes in Solution Processable Metal-Oxide Thin Film Transistor

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SUPPORTING INFORMATION

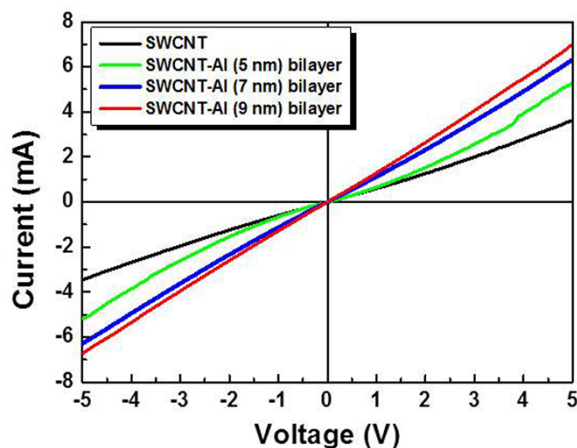


Fig. S1 The current-voltage curves of SWCNT-Al bilayer film; the thicknesses of Al layer were none (black line), 5 (green line), 7 (blue line) and 9 nm (red line), respectively.

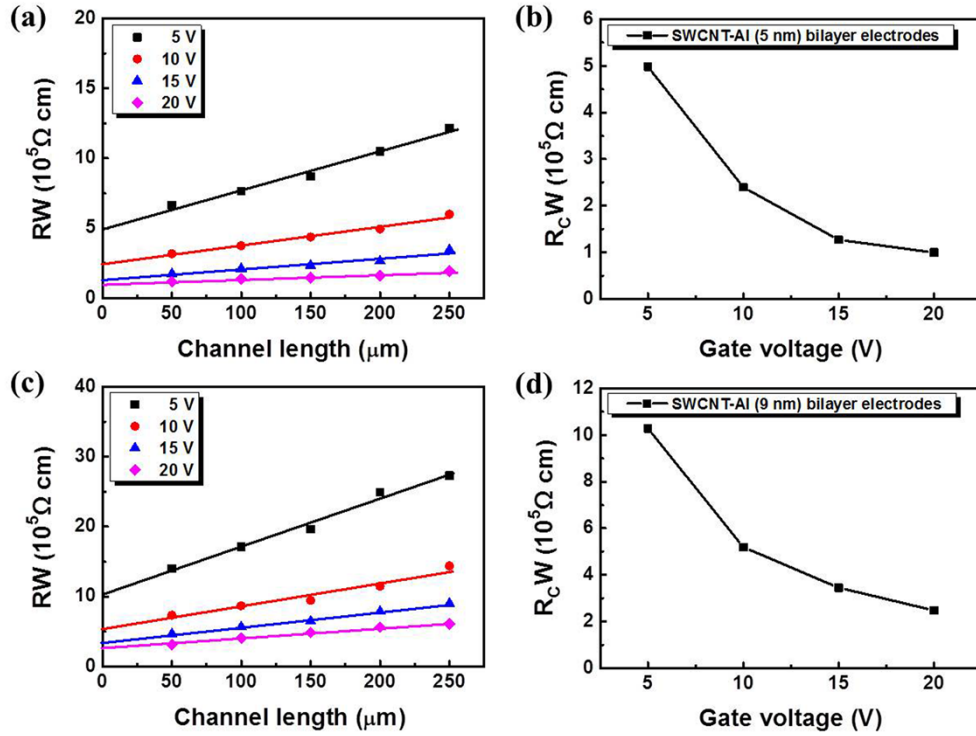


Fig. S2 Width normalized resistance (RW) as a function of channel length with different gate voltages (V_{GS}) from 5 to 20 V for SWCNT/5 nm-thick Al bilayer and (c) SWCNT/9 nm-thick Al bilayer electrode TFTs. Width normalized contact resistance (R_CW) for (b) SWCNT/5 nm-thick Al bilayer and (d) SWCNT/9 nm-thick Al bilayer electrode TFTs with various gate voltages.

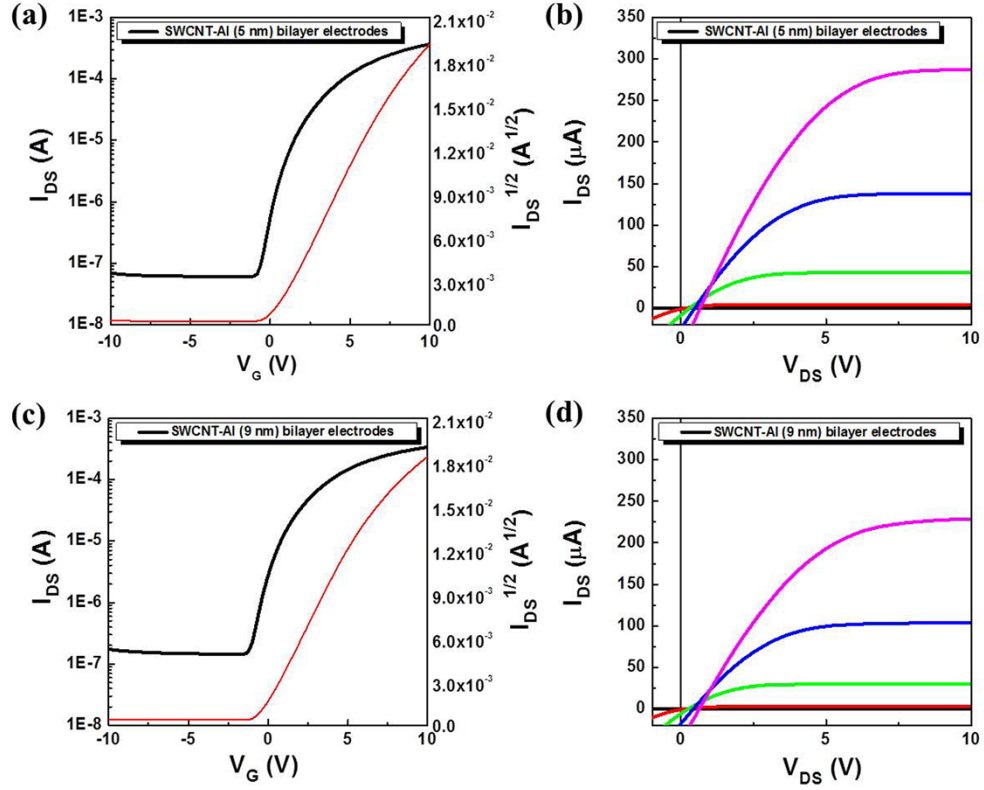


Fig. S3 Electrical properties of TFTs. Transfer characteristics of (a) SWCNT/5 nm-thick Al bilayer and (c) SWCNT/9 nm-thick Al bilayer electrode TFTs with a V_D of 5 V. Output characteristics of (b) SWCNT/5 nm-thick Al bilayer and (d) SWCNT/9 nm-thick Al bilayer electrode TFTs with $V_{GS} = 0$ to 8 V in 2 V steps.

Table S1 Summarized electrical properties of SWCNT-Al bilayer electrode TFTs with the Al thickness of 5 and 9 nm, respectively.

TFT Structure	Sub-threshold slope (V/decade)	Threshold voltage (V)	Field-effect mobility ($\text{cm}^2/\text{V}\cdot\text{s}$)	On/off current ratio
SWCNT-Al (5 nm) bilayer / $\text{In}_2\text{O}_3/\text{HfO}_2/\text{ITO}/\text{Glass}$	0.75	0.41	4.02	3.67×10^4
SWCNT-Al (9 nm) bilayer / $\text{In}_2\text{O}_3/\text{HfO}_2/\text{ITO}/\text{Glass}$	0.94	-1.12	3.67	3.37×10^4

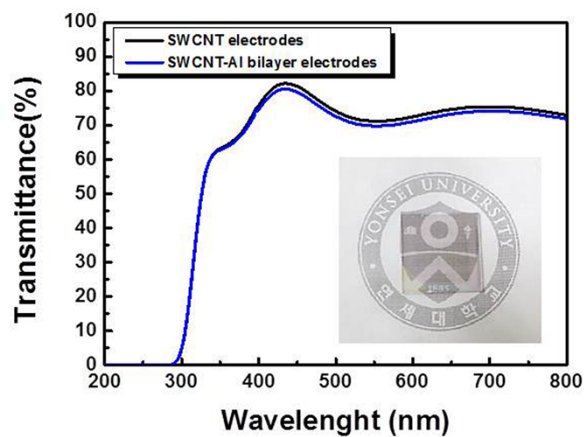


Fig. S4 Optical transmittance spectra of the SWCNT and the SWCNT-Al bilayer electrode TFTs. The inset shows the optical image of SWCNT-Al bilayer electrode TFT.