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Supplementary Information

Flexible Metal Nanowire-Parylene C Transparent Electrodes for Next Generation Optoelectronic Devices

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Measurement and characteristics

A parylene C protection layer was deposited by pyrolytic deposition system (NURI TECH, NRPC-500). A UV/Vis/NIR spectrophotometer (Agilent, Cary-4000) was used to measure the optical transmittance of metal NW and metal NW-Parylene C films. The sheet resistances were measured using a non-contact sheet measurement instrument (NAPSON corp., EC-80). Scanning electron microscope (HITACH S-4800) was used to investigate the surface of metal NW and metal NW-Parylene C TEs. The Raman spectra of both samples were measured using a Raman spectrometer (Almega XR, Thermo scientific). The surface morphology of the metal NW and metal NW-Parylene C TEs was measured using Atomic Force Microscope (NX10, Park systems). The haze was measured with Nippon Denshoku haze meter (COH-400). Mechanical flexibility tests of AgNW-parylene C/PET and ITO/PET TEs were performed using a bending tester (ZBT-200, Z-tec). The current density - voltage (J-V) measurements of organic solar cell devices were performed using a solar simulator (Mcscience Inc., K-3300) under AM 1.5 G illuminations (100 mW cm^{-2}). All measurements were carried out under ambient conditions at room temperature.

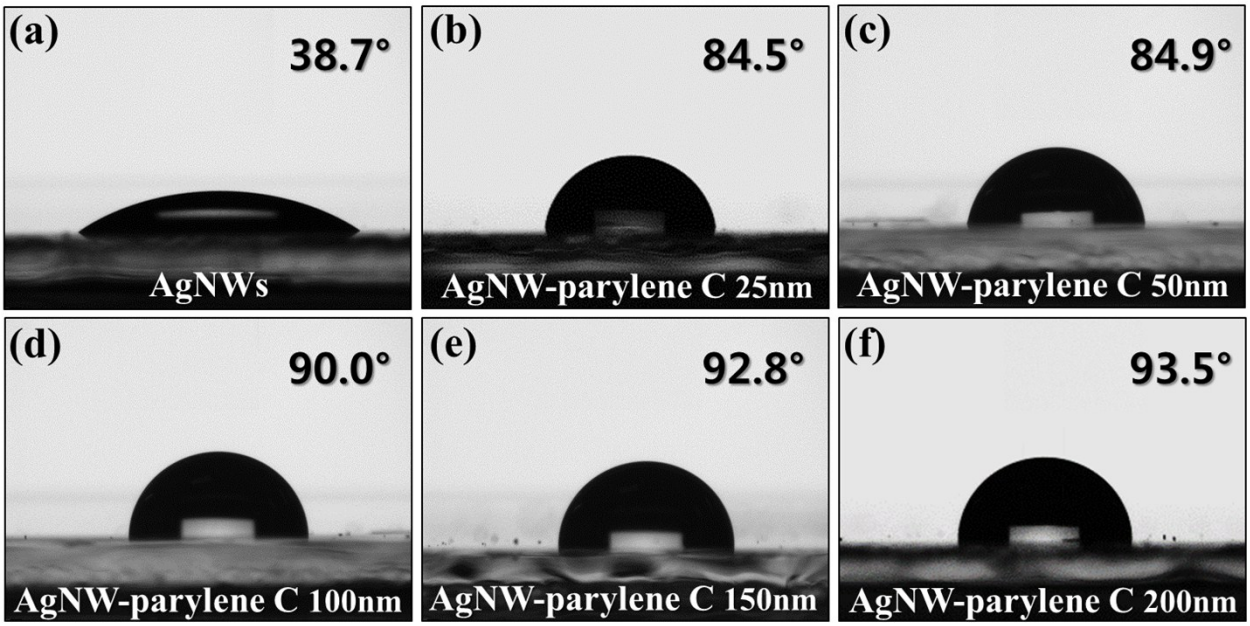

Fig. S1 Contact angle measurements of (a) the AgNW and AgNW-parylene C TEs with (b) 25nm, (c) 50nm, (d) 100nm, (e) 150nm, (f) 200nm parylene C layers using deionized water droplet.

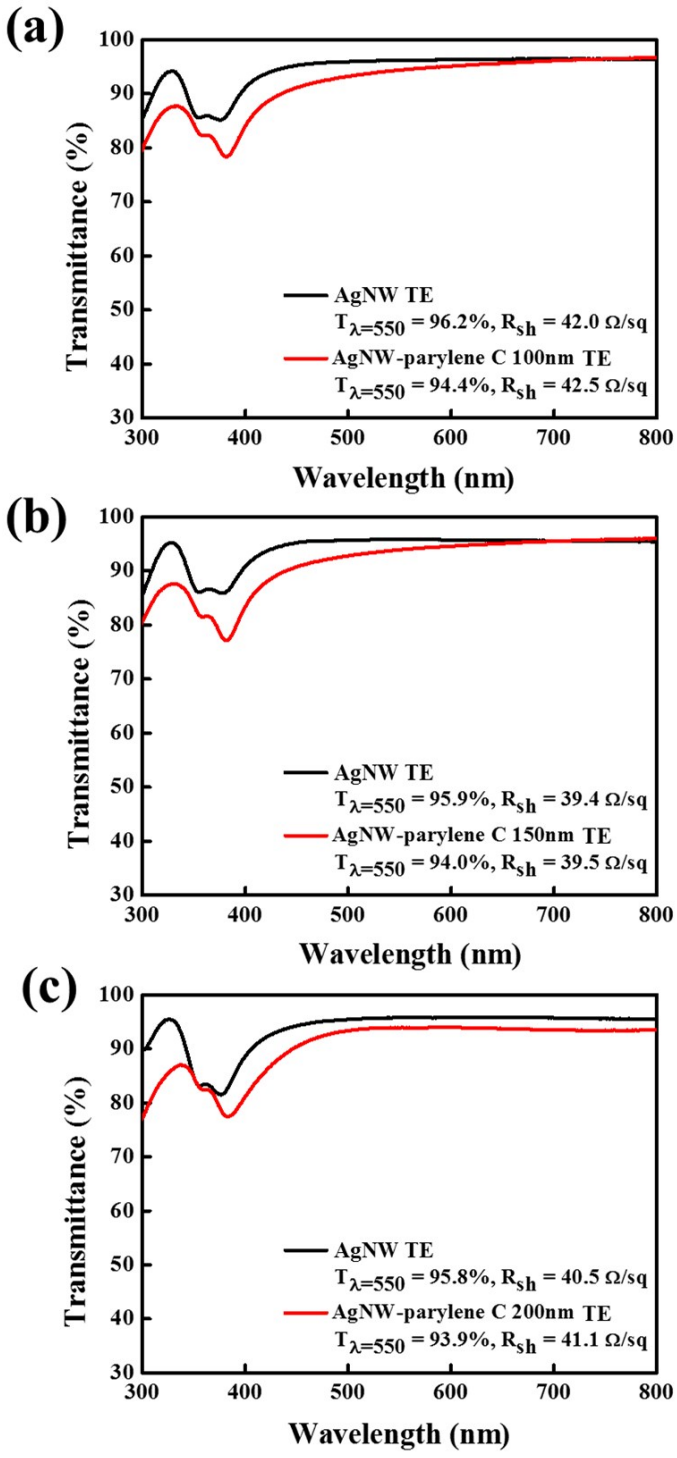

Fig. S2 Optical transmittance spectra and sheet resistances of AgNW-parylene C TEs with various thickness of parylene C layers (a) 100nm, (b) 150nm, (c) 200nm.

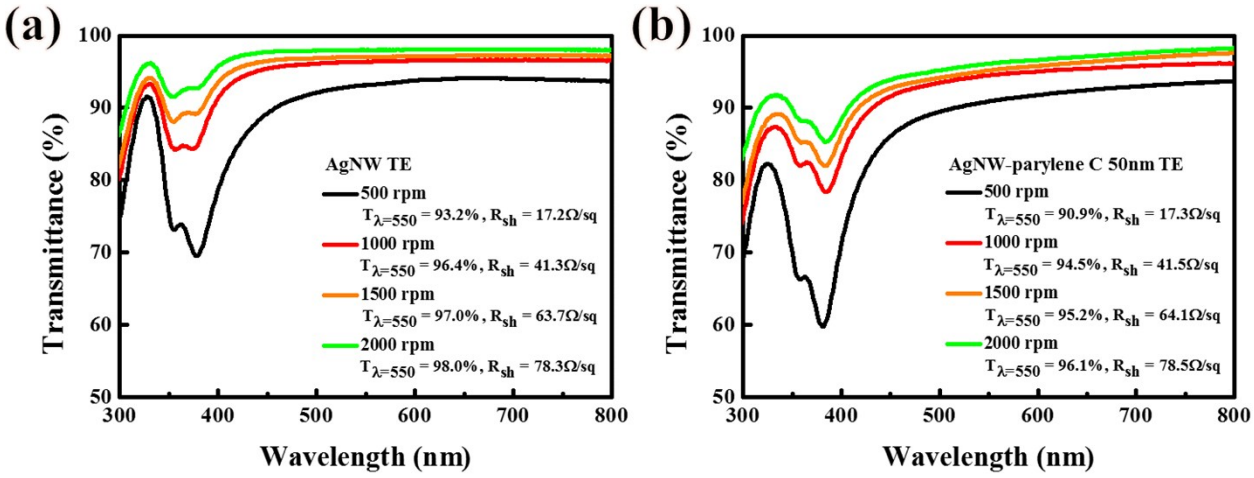

Fig. S3 Optical transmittance spectra and sheet resistances of AgNW and AgNW-parylene C TEs with the spin coating speed from 500 rpm to 2000 rpm.

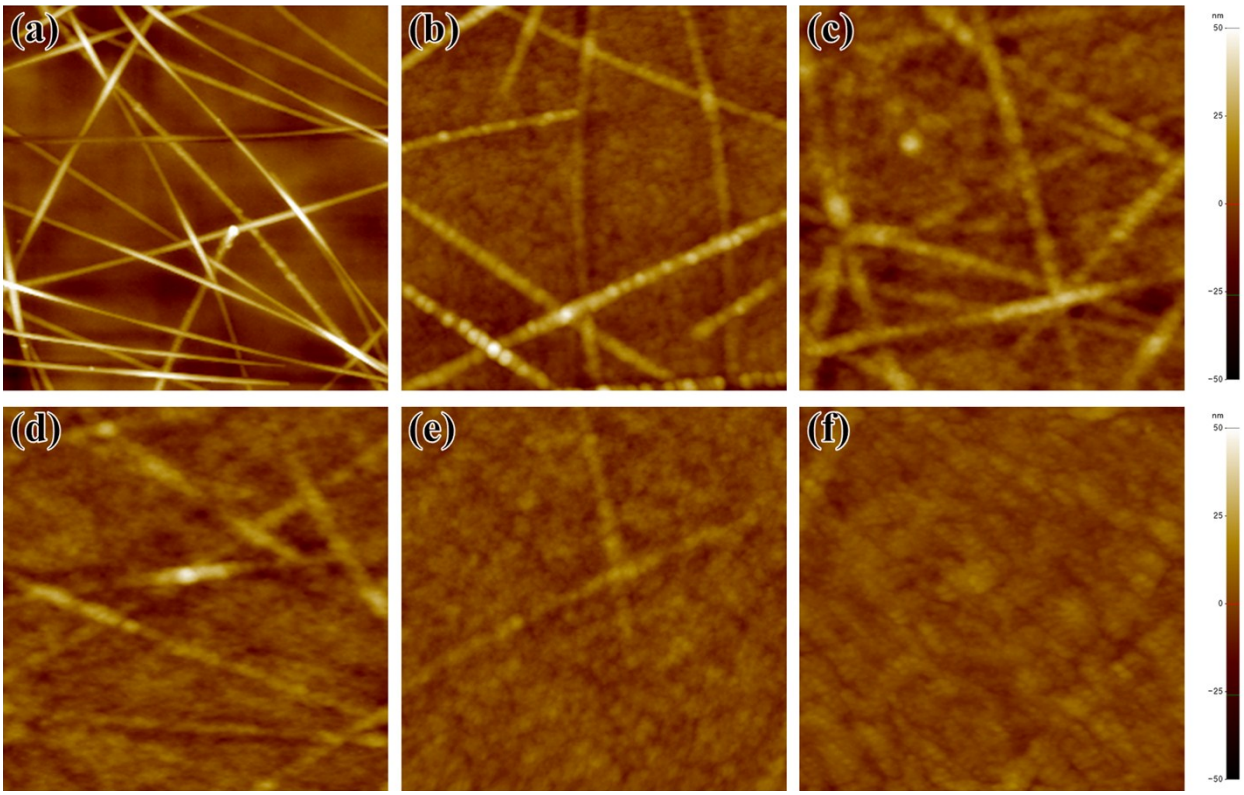

Fig. S4 AFM topographies of (a) AgNW and AgNW-parylene C TEs with various thickness of parylene C protection layers (b) 25nm, (c) 50nm, (d) 100nm, (e) 150nm, and (f) 200nm.

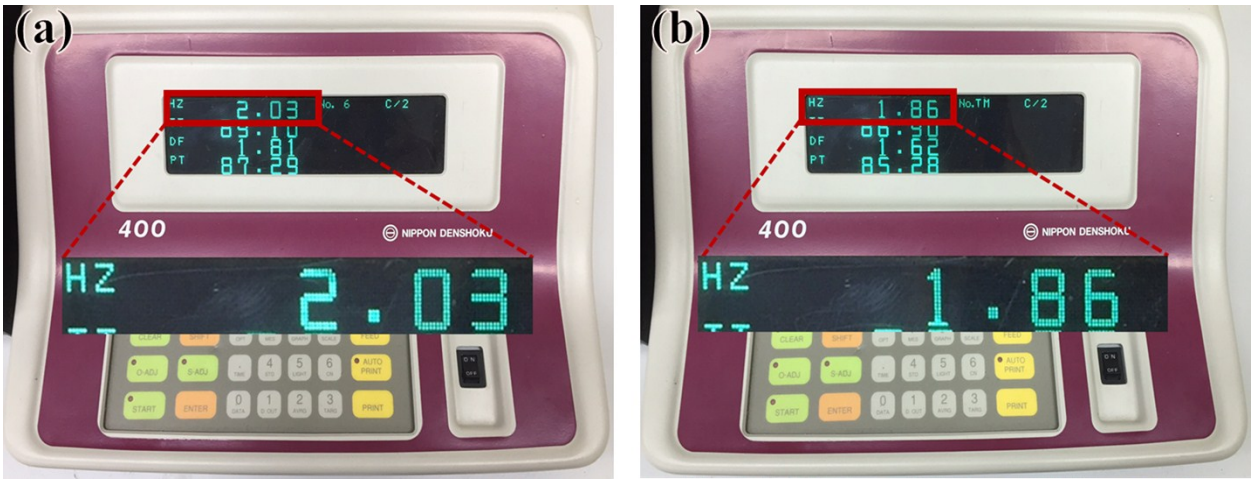

Fig. S5 Haze test of (a) AgNW/PET and (b) AgNW-Parylene C/PET TEs.

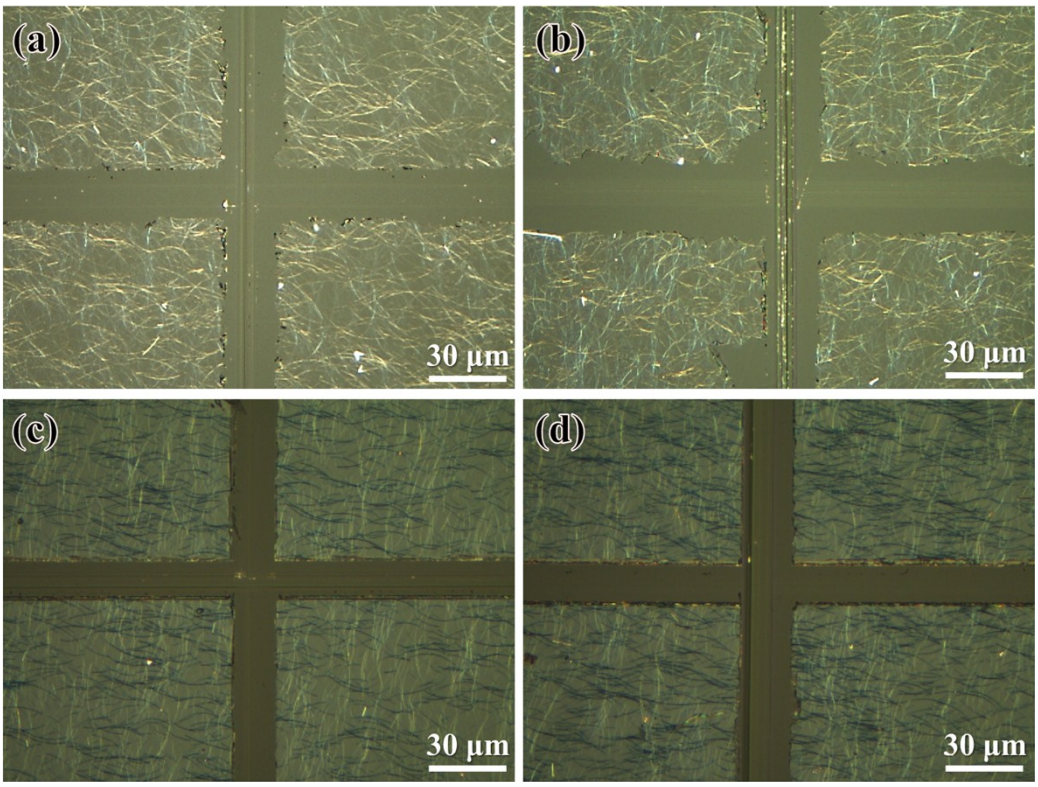

Fig. S6 OM images of (a), (b) AgNW and (c), (d) AgNW –parylene C TEs which have the square lattice patterns before and after cross-cut test with a 3M scotch tape.

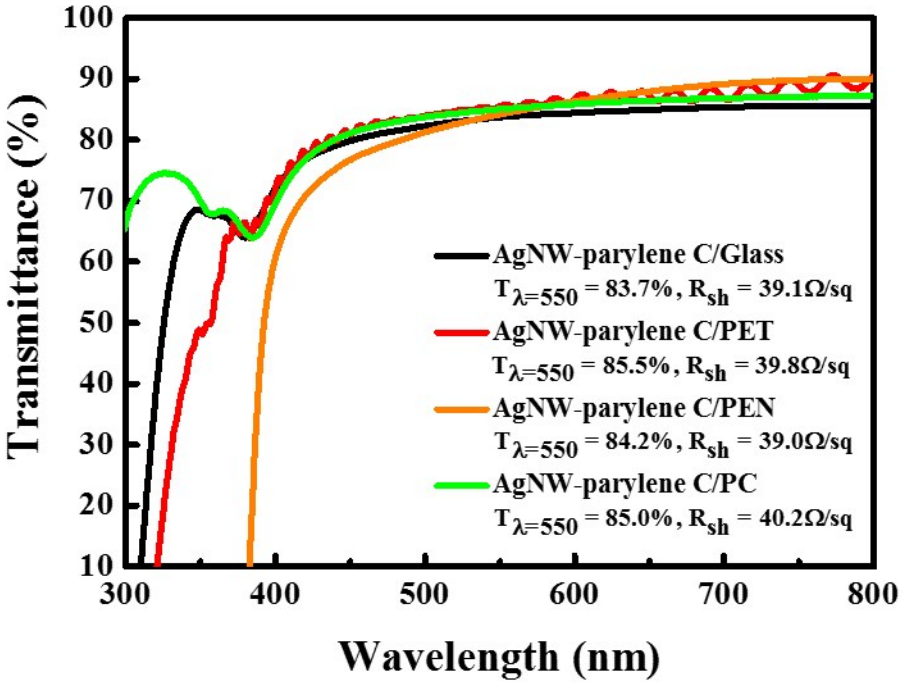

Fig. S7 Optical transmittance spectra and sheet resistance values of AgNW-parylene C TEs prepared onto various substrates such as glass, PET, PEN, and PC.

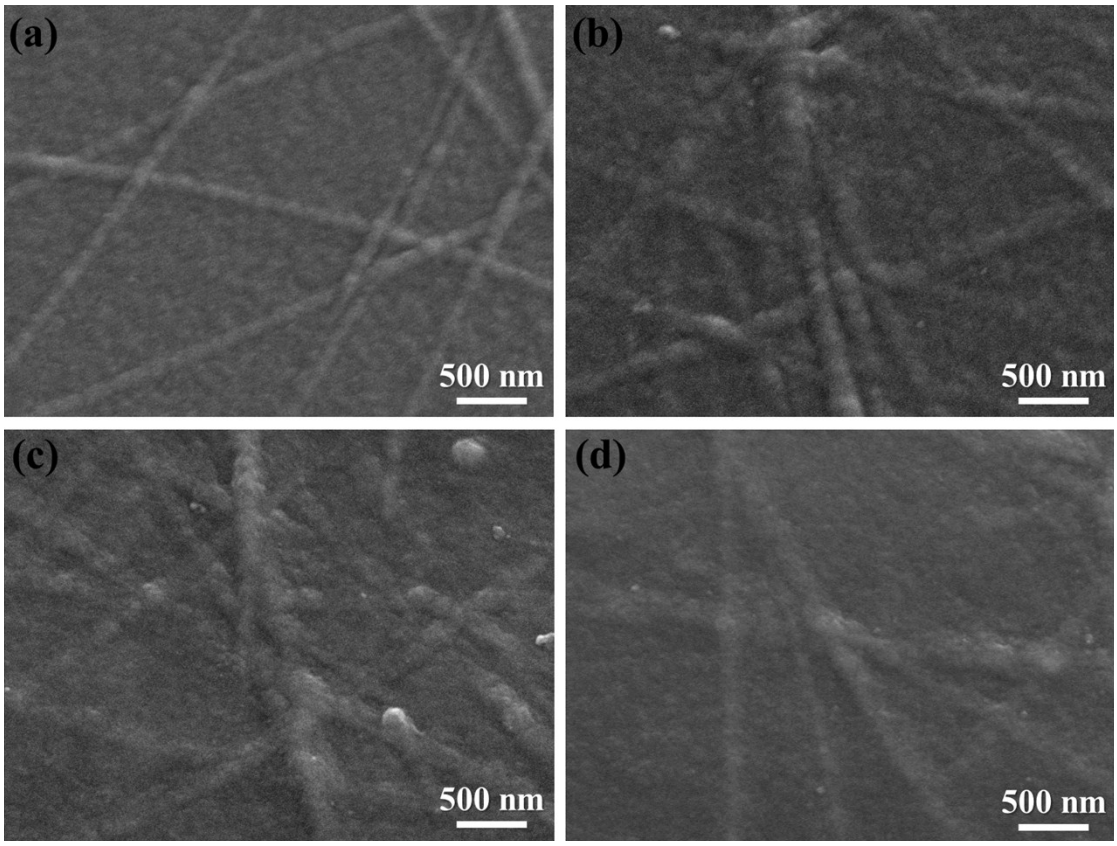

Fig. S8 SEM images of (a) AgNW-parylene C 50nm, (b) AgNW-parylene C 100nm, (c) AgNW-parylene C 150nm, and (d) AgNW-parylene C 200nm TEs after the long-term stability test at 70 °C and 70% RH.

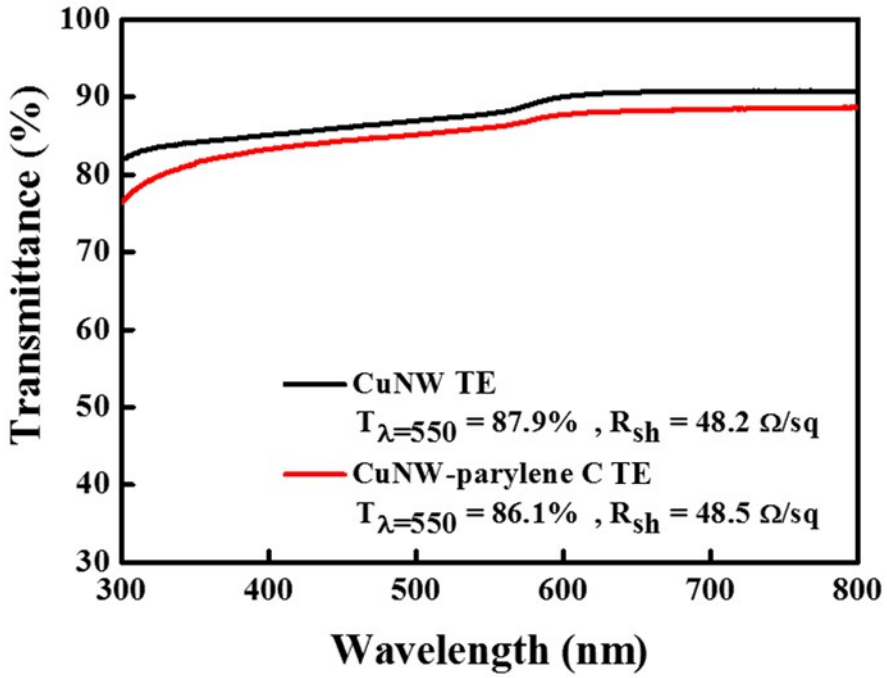

Fig. S9 Optical transmittance spectra and sheet resistance values of CuNW and CuNW-parylene C TEs.

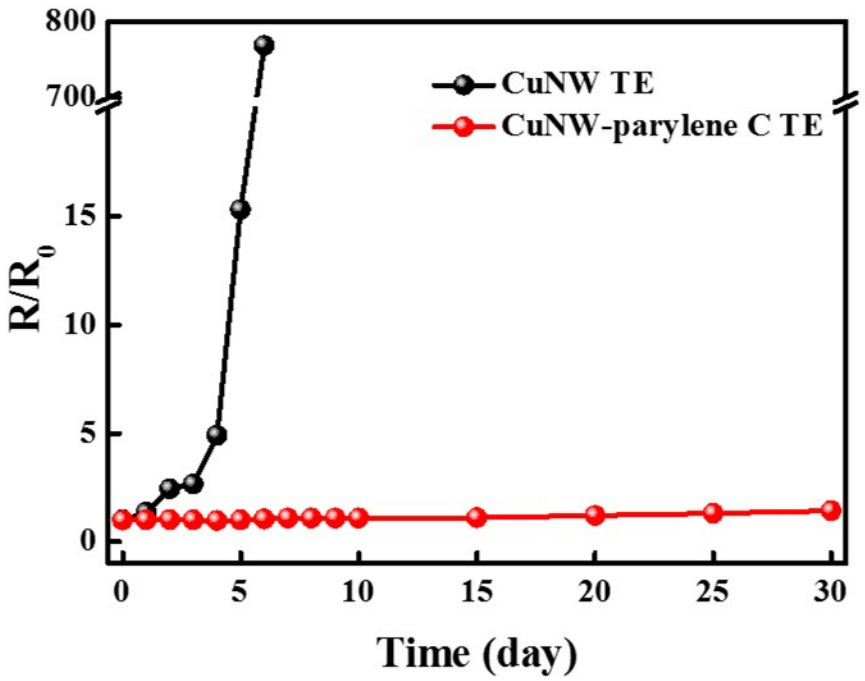

Fig. S10 Sheet resistance change of CuNW and CuNW-parylene C TEs during the long-term stability test at ambient condition for 30 days.

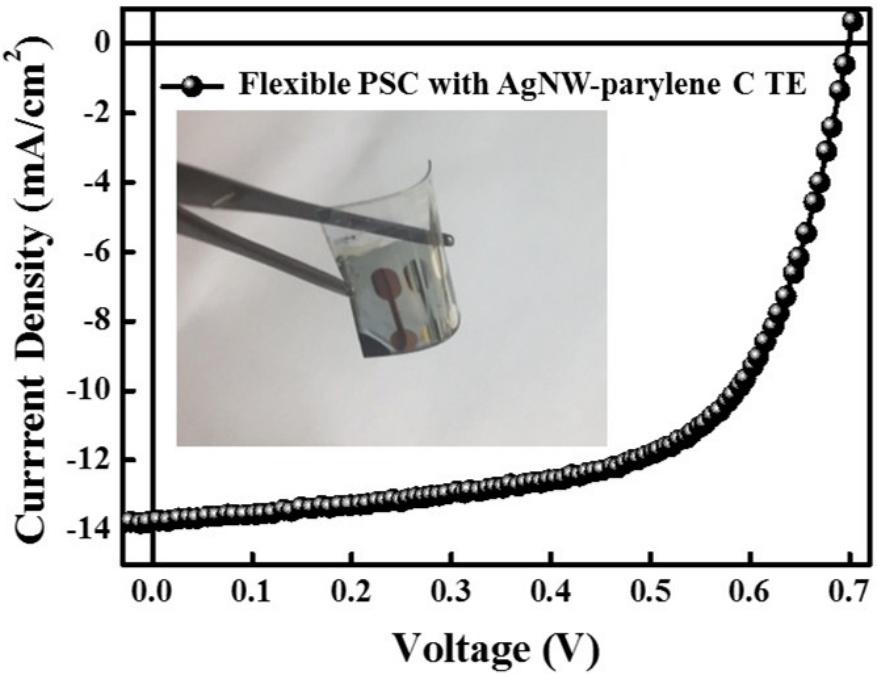

Fig. S11 Current density–voltage (*J*–*V*) characteristics of flexible bulk heterojunction (BHJ) polymer solar cell with AgNW-parylene C/PET TE. The inset shows the photograph of the flexible BHJ PSC with AgNW-parylene C/PET TE.