Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Switching the Optical and Electrical Properties of Carbon Nanotube Hybrid Films using a Photoresponsive Dispersant as a Dopant

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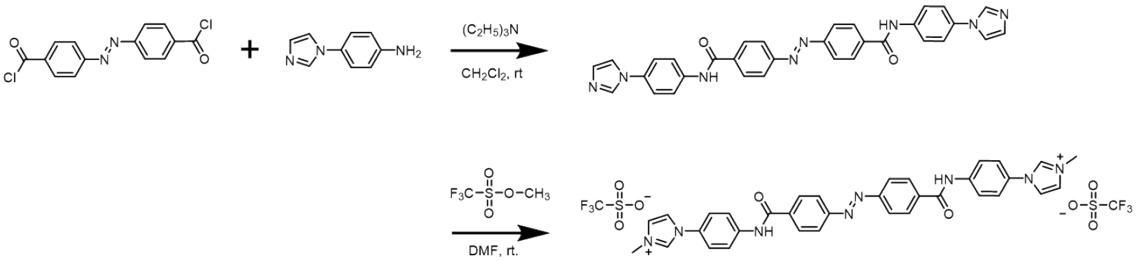

Scheme S1. Synthetic route of **AB**.

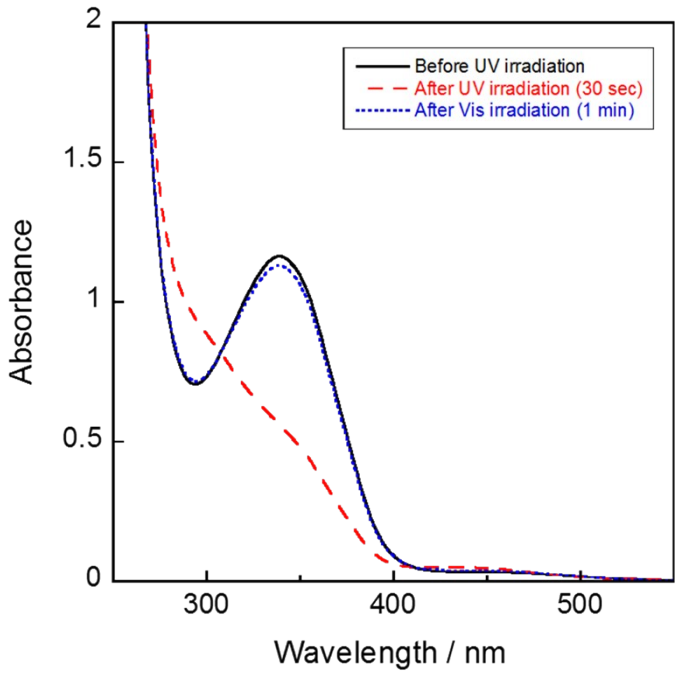

Fig. S1 (a) UV-Vis-NIR spectra of the **AB** (0.05 mM) in propylene carbonate. The black solid, red dashes and blue dotted lines indicate the absorption spectra before and after UV irradiation (365 nm, 20 mW/cm^2, and 30 sec) and Vis irradiation (436 nm, 25 mW, and 1 min), respectively.

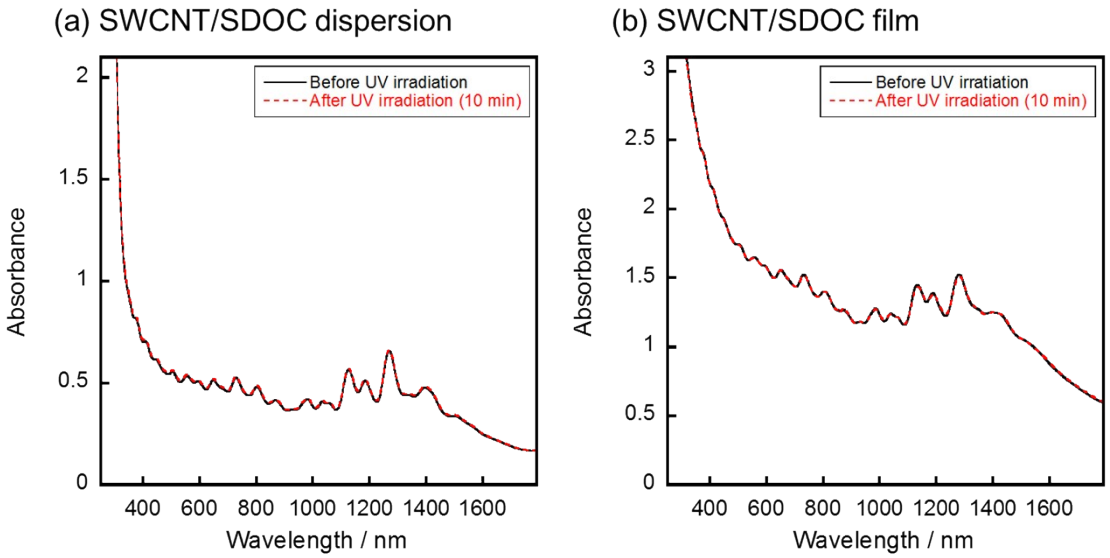

Fig. S2 (a) UV-Vis-NIR spectra of the SWCNT/SDOC in (a) D_2O solution, and (b) solid film. The black solid, red dashes and blue dotted lines indicate the absorption spectra before and after UV irradiation (365 nm, 20 mW/cm^2, and 10 min).

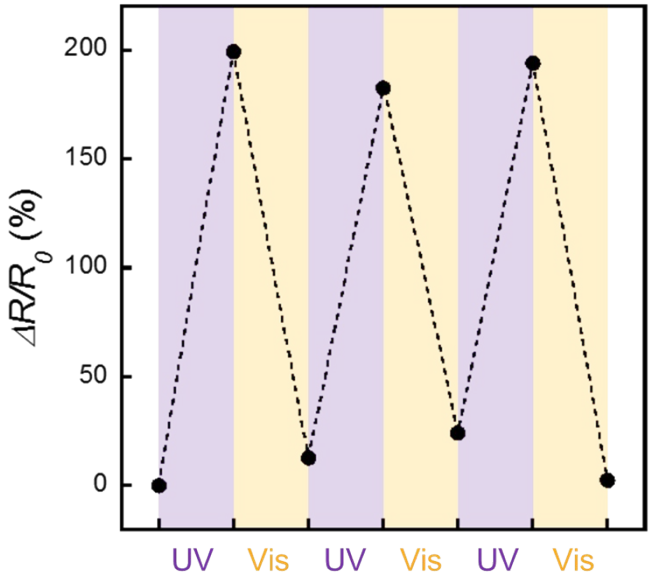

Fig. S3 Sheet resistance changes of the SWCNT/**AB** hybrid film with UV (365 nm, 20 mW cm^{-2}, and 2 min) and visible light (436 nm, 10 mW cm^{-2}, 20 min) irradiation.

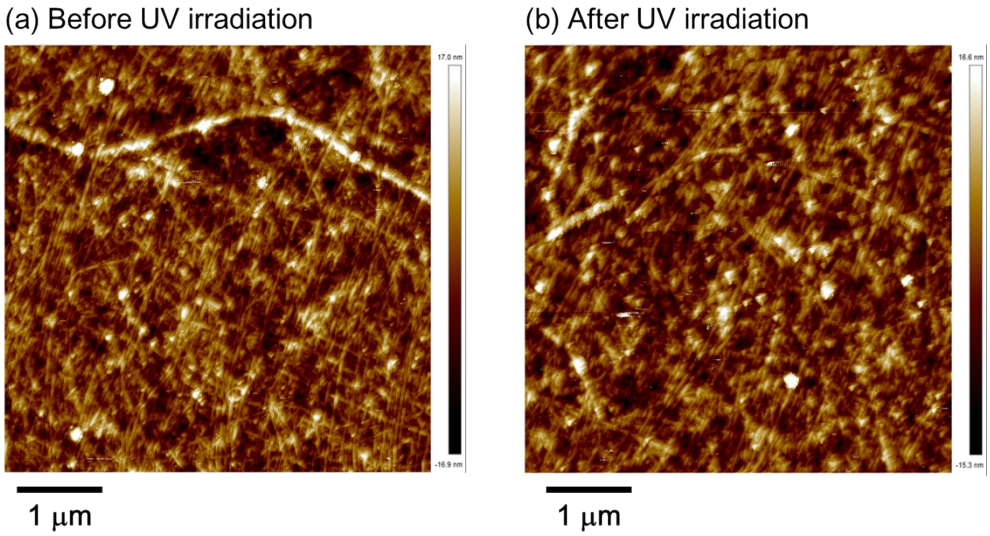

Fig. S4 AFM images of the SWCNT/**AB** hybrid film on glass substrate (a) before UV irradiation and (b) after UV irradiation.

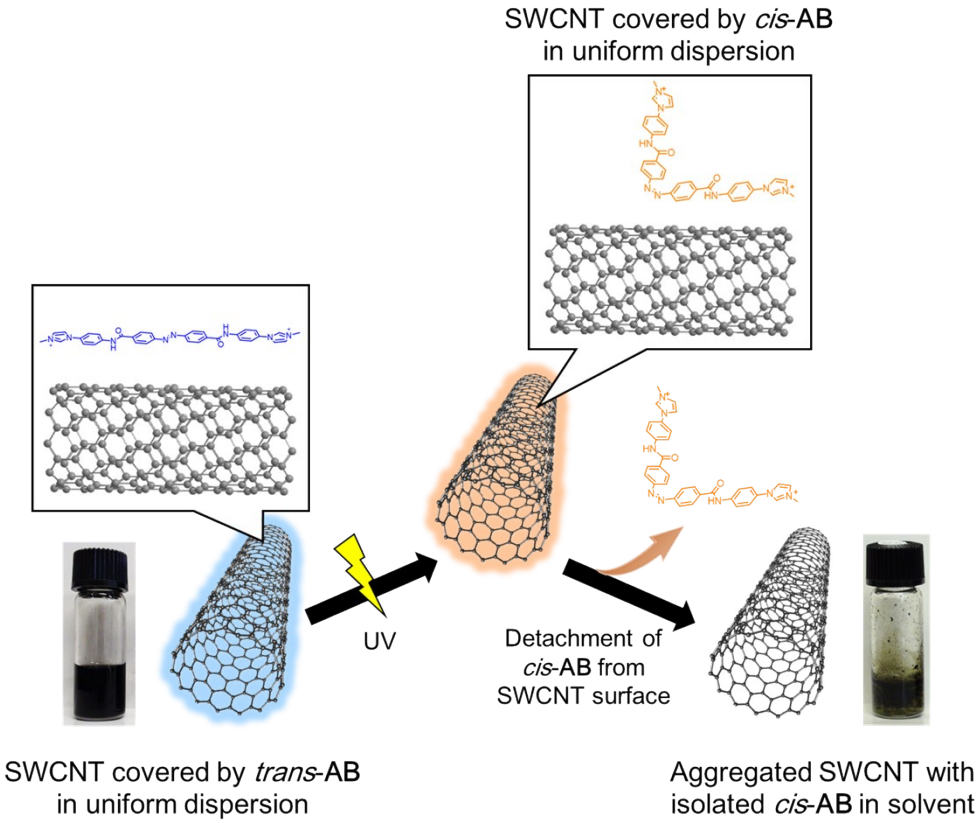

Fig. S5 Schematic representation and photos of the light-induced switching of **AB** (only the cationic part is displayed) on the SWCNT surface in dispersion (PC solvent).

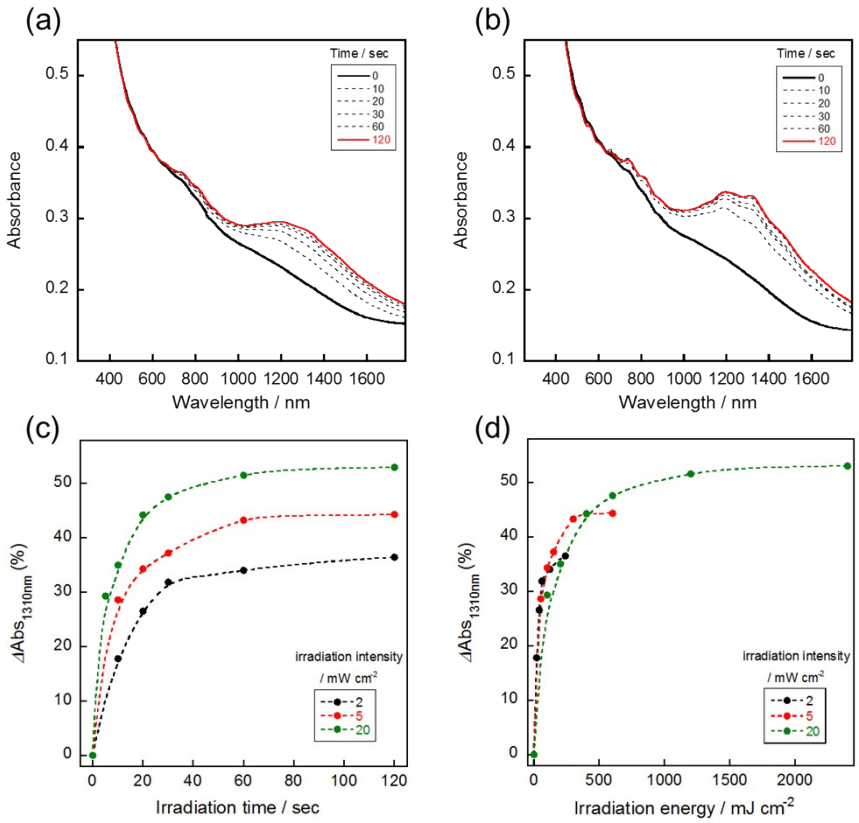

Fig. S6 (a) Time dependent UV-Vis-NIR spectral change of the SWCNT/**AB** hybrid film with irradiation of (a) low intense UV light (365 nm, 2 mW cm^{-2}) and (b) high intense UV light (365 nm, 20 mW cm^{-2}). (c) Change ratio of absorbance ($\Delta Abs_{1310\ nm}$) *versus* irradiation time. (d) Change ratio of absorbance (ΔAbs_{1310}) *versus* irradiation energy.

Table S1 Electric property and Raman data of SWCNT film in various conditions

Samples		Electric property		Raman spectroscopy		Ref.
		Index	Value	G band	I_{2D}/I_G	
SWCNT/ **AB**	As prepared	Sheet resistance	3.1×10^3 Ω/sq	1590 cm^{-1}	0.32	This work
	UV irrad.		9.5×10^3 Ω/sq	1594 cm^{-1}	0.36	
	Vis irrad.		3.4×10^3 Ω/sq	1590 cm^{-1}	0.32	
SWCNT/ SDOC	As prepared	Sheet resistance	3.6×10^5 Ω/sq	1594 cm^{-1}	0.53	
	UV irrad.		3.5×10^5 Ω/sq	1594 cm^{-1}	0.53	
SWCNT/ Azo-PMMA	As prepared	Electrical conductivity	1.75 x 10^{-3} S/m	-	0.62	S1
	UV irrad.		4.45 x 10^{-3} S/m	4 cm^{-1} blue shift from as prepared sample	0.41	
	In dark (2 min)		1.75 x 10^{-3} S/m	-	-	
Graphene/ Azobenzene	As prepared	Conductance	-	1591 cm^{-1}	-	S2
	UV irrad.		1.80 mS	1588 cm^{-1}	-	
	Vis irrad.		1.65 mS	1591 cm^{-1}	-	

References

S1) S. Li, Y. Feng, P. Long, C. Qin and W. Feng, *J. Mater. Chem. C*, 2017, **5**, 5068–5075.

S2) M. Kim, N. S. Safron, C. Huang, M. S. Arnold and P. Gopalan, *Nano Lett*., 2012, **12**, 182–187.