Supplementary Material

Light-switching conductance of anisotropic azobenzene-based polymer close-packed on horizontally aligned carbon nanotubes

Shuangwen Li [a, d], Yiyu Feng [a, c, d], Peng Long [a], Chengqun Qin [a], Wei Feng [a, b, c, d*]

[a] School of Materials Science and Engineering, Tianjin University, Tianjin 300072, P. R China.

[b] Collaborative Innovation Centerof Chemical Science and Engineering (Tianjin), Tianjin 300072, P. R China.

[c] Key Laboratory ofAdvanced Ceramics and Machining Technology, Ministry of Education, Tianjin 300072, P. R China.

[d] Tianjin Key Laboratory of Composite and Functional Materials, Tianjin 300072, P. R China.

*Corresponding author. Tel.: +86 22 87402059. Fax: +86 22 27404824. E-mail address: weifeng@tju.edu.cn (W. Feng).

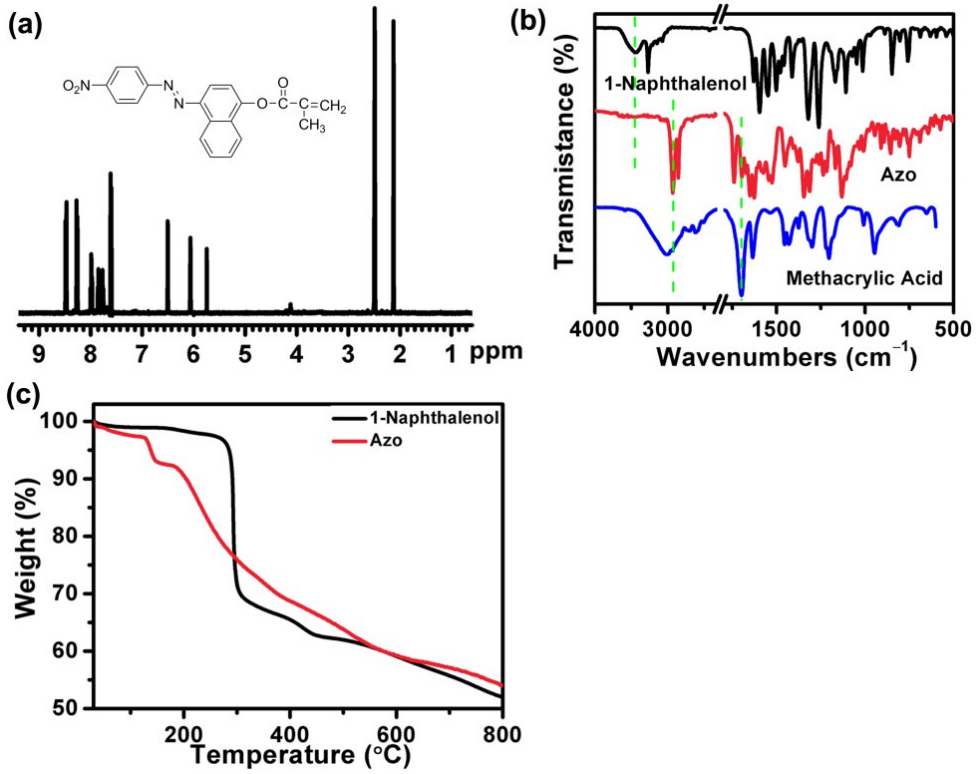

Fig. S1 Chemical structure of Azo monomers: (a) ^{1}H NMR spectrum; (b) FTIR spectra; (c) TGA spectra.

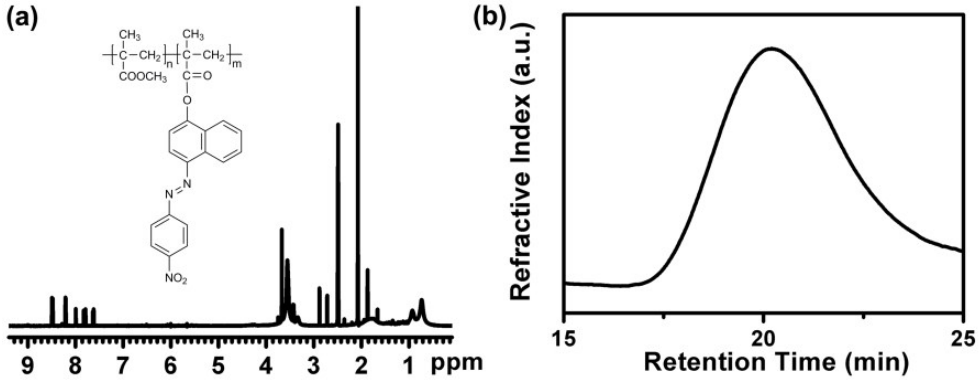

Fig. S2 Chemical structure of Azo–PMMA polymer: (a) ^{1}H NMR spectrum; (b) GPC chromatogram.

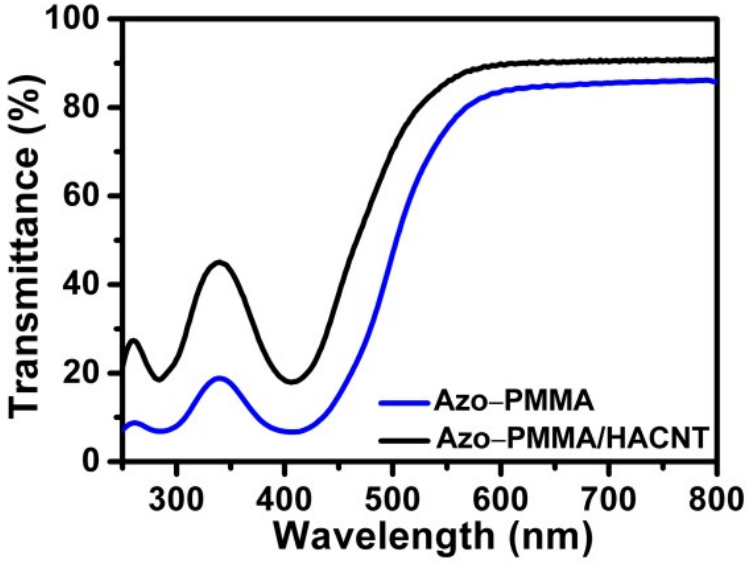

Fig. S3 UV–Vis transmittance spectra of pure Azo–PMMA and Azo–PMMA/HACNT composite film.

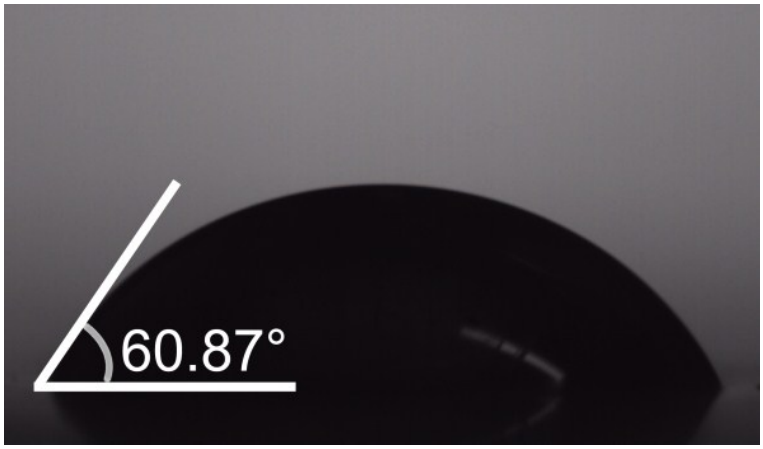

Fig. S4 Digital image of the contact angle of Azo–PMMA on unmodified HACNT film.

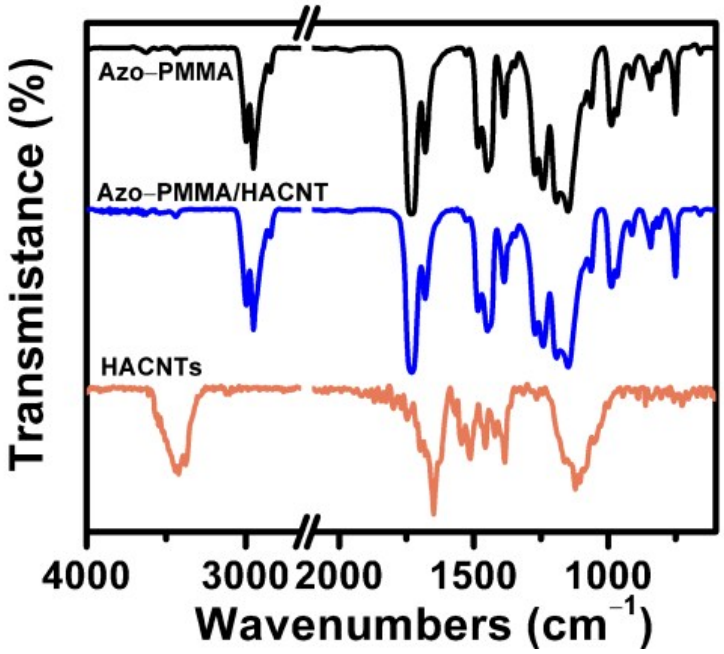

Fig. S5 FTIR spectra of HACNTs, pure Azo–PMMA and Azo–PMMA/HACNT composite film.

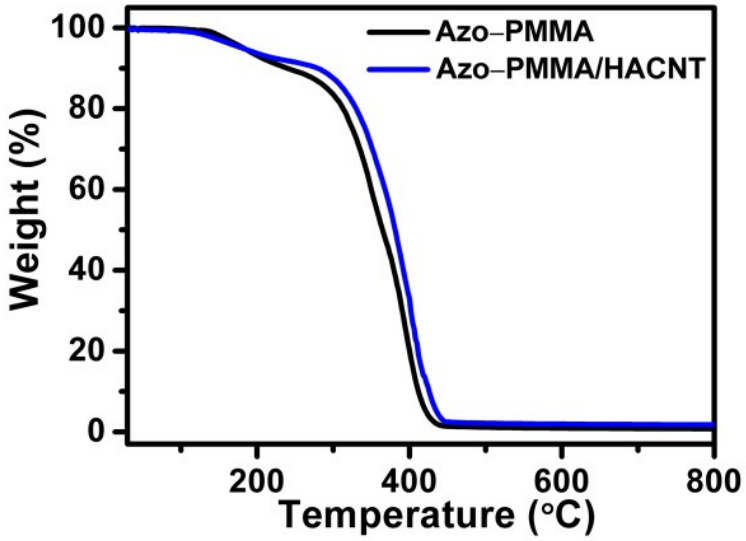

Fig. S6 TGA spectra of pure Azo–PMMA and Azo–PMMA/HACNT composite film.

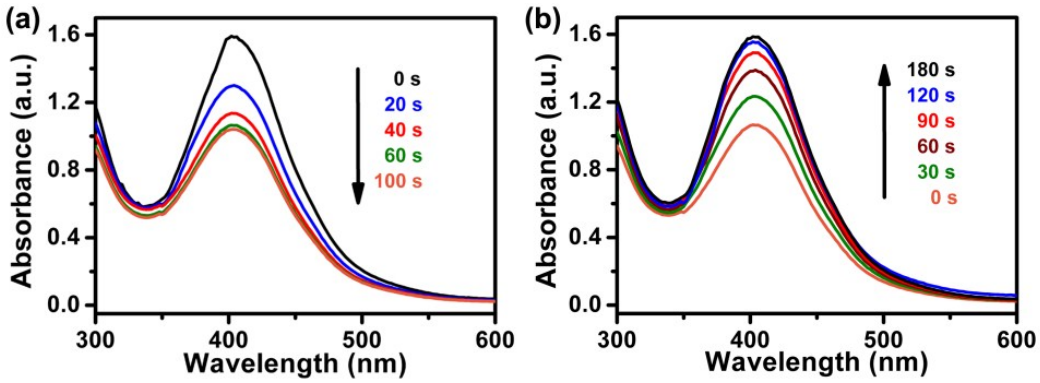

Fig. S7 UV–Vis absorption spectra changes of Azo–PMMA film: (a) upon irradiation with UV–365 nm; (b) in darkness after the irradiation.

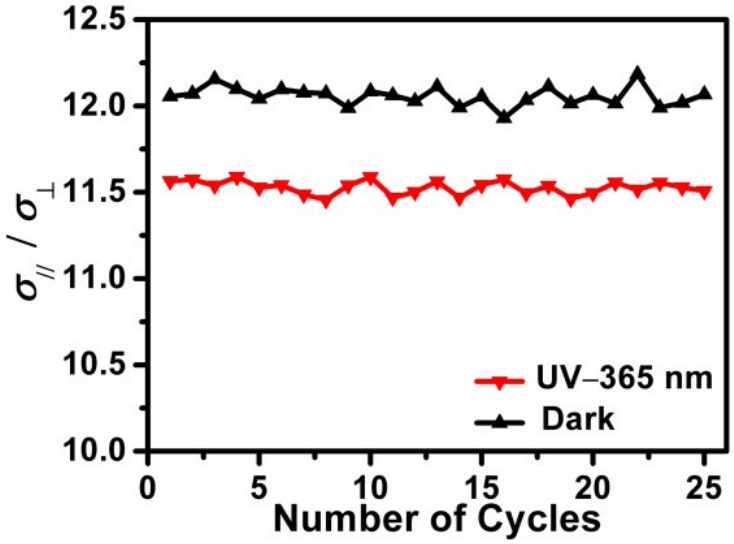

Fig. S8 Anisotropic electrical conductivity of Azo–PMMA/HACNT composite film before and after UV irradiation at 365 nm.

Table S1. Photo-switchable conductance of Azo–grafted nanocarbon composites

Samples	Light		Properties			Mechanism	Ref.
	Wavelength (nm)	Intensity (mW/cm^2)	Photocurrent (mA)	Response time (s)	Anisotropy		
Azo-FWCNT	365	2.45	0.143	300	–	Trans–cis	S1
Azo-GO	365	2.45	2.5×10^{-5}	1200	–	Trans–cis	S2
Azo-SWNT	500	20	3×10^{-5}	~5	–	Trans–cis	S3
Azo-polymer/SWNT	375	1.5×10^{3}	1	~100	–	Pool–Frenkel type	S4
Azo-polymer/MWCNTs	370	3	0.015	~600	–	geometrical effect	S5
This work	365	1.32	4.45 0.389	62.7 63.9	Anisotropy	Synergistic Effect	

∗The applied voltage in the all the studies was 1 V.

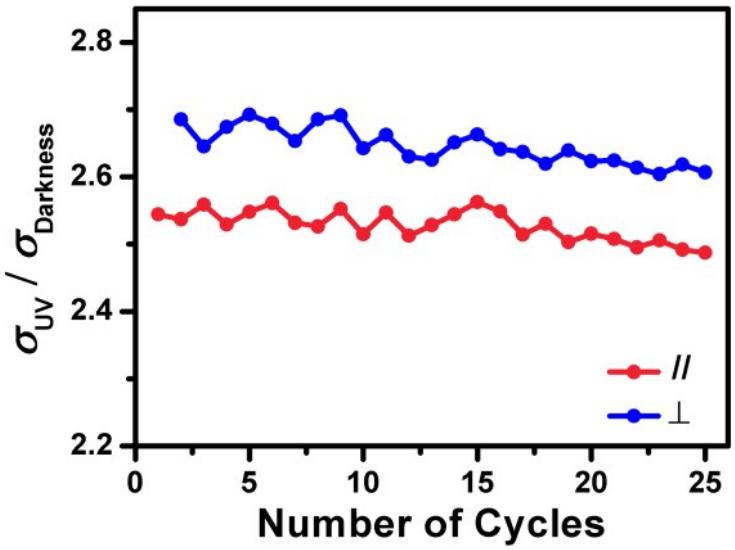

Fig. S9 Anisotropic light-induced conductance switching of Azo–PMMA/HACNT composite film.

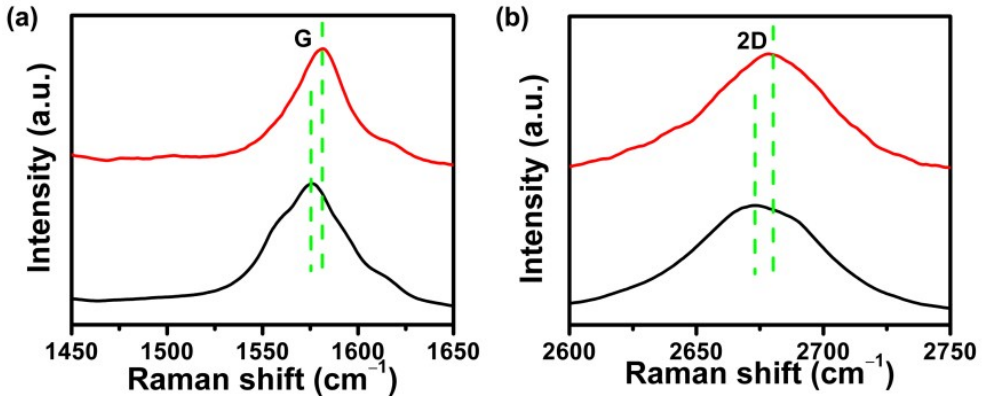

Fig. S10 Raman spectra of Azo–PMMA/HACNT composite film before and after UV irradiation at 365 nm.

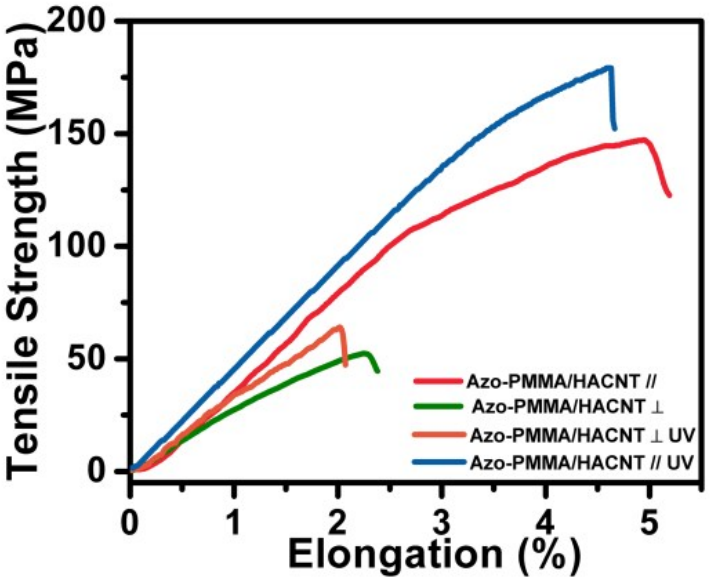

Fig. S11 Anisotropic tensile strength of Azo–PMMA/HACNT composite film before and after UV irradiation at 365 nm.

References

S1 Y. Feng, X. Zhang, X. Ding and W. Feng, *Carbon*, 2010, **48**, 3091.

S2 X. Zhang, Y. Feng, D. Huang, Y. Li and W. Feng, *Carbon*, 2010, **48**, 3236.

S3 X. Zhou, T. Zifer, B. M. Wong, K. L. Krafcik, F. Léonard and A. L. Vance, *Nano Lett.*, 2009, **9**, 1028.

S4 V. Schneider, T. Strunskus, M. Elbahri and F. Faupel, *Carbon*, 2015, **90**, 94.

S5 S. W. Basuki, V. Schneider, T. Strunskus, M. Elbahri and F. Faupel, *ACS Appl. Mater. Interfaces*, 2015, **7**, 11257.