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Supporting Information

Dispersion of carbon nanotubes in water by self-assembled micelles of branched amphiphilic multifunctional copolymer with photosensitivity and electroactivity

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S1 Synthesis and characterizations of VCz

The synthesis route of VCz has been report in the literature.[1] Carbazole (7.5 g, 45.0 mmol), potassium hydroxide (4.5 g, 80.0 mmol) and 120 mL N, N-dimethylacetamide (DMF) were added to a three-necked flask. After stirring for 15min, 4-vinylbenzyl chloride (6.8 g, 45.0 mmol) was added slowly to the mixture and continued reaction for 5 h at room temperature. Then the resulting mixture was poured into water (500 mL) and the precipitate was collected by filtration and washed with hot alcohol at about 70 °C several times to remove the un-reacted carbazole. The final white product VCz was dried at 80 °C under vacuum for 5 h, with the yield of 80% (10.1 g). ^{1}H NMR ($CDCl_3$, 400 MHz), δ (ppm): 5.21-5.18 (d, 1H), 5.70-5.65 (d, 1H), 5.45 (s,2H), 6.68-6.60 (m, 1H), 7.44-7.40 (m, 2H), 7.36-7.34 (d, 2H), 7.30-7.27 (m, 2H),7.25-7.23 (d, 2H), 7.10-7.08 (d, 2H), 8.14-8.12 (d, 2H). The ^{1}H NMR analysis of VCz indicated the successful preparation of VCz (Fig. S2).

S2 Tables and Figures of contents

S3 Supplementary Tables and Figures

Table S1. Experimental conditions of polymers

Sample[a]	VCz (mmol)	VM (mmol)	MA (mmol)	VBT (mmol)	AIBN (mmol)	Time (h)
LPVCM	5	5	13	0	0.46	24
$BPVCM_{t2}$	5	5	13	0.46	0.46	2
$BPVCM_{t3}$	5	5	13	0.46	0.46	3
$BPVCM_{t4}$	5	5	13	0.46	0.46	4
$BPVCM_{t6}$	5	5	13	0.46	0.46	6
$BPVCM_{t12}$	5	5	13	0.46	0.46	12
$BPVCM_{t24}$	5	5	13	0.46	0.46	24
$BPVCM_{4}$	5	5	13	0.92	0.46	24
$BPVCM_{8}$	5	5	13	1.84	0.46	24
$BPVCM_{16}$	5	5	13	3.68	0.46	24

a) The subscript of the sample ($BPVCM_{t2\text{-}t24}$) is the different polymerization time and that of ($BPVCM_{4\text{-}16}$) is the different content of VBT, under 65 °C. As a comparison, LPVCM was synthesized without VBT.

Table S2. The main structure and performance parameters for LPVCM and a series of BPVCM copolymer

Sample[a]	Yield %	M_w (GPC) $\times 10^{-3}$ g/mol	PDI (GPC)	M_w[b] (LS) $\times 10^{-4}$ g/mol	$[\eta]$[c] m L / g	g' %
LPVCM	90.77	9.074	1.890	2.780	9.0	-
$BPVCM_{t2}$	37.80	7.564	1.470	1.923	5.7	93.72
$BPVCM_{t3}$	53.40	7.417	1.478	1.897	6.1	88.42
$BPVCM_{t4}$	63.32	8.528	1.479	2.113	4.8	72.35
$BPVCM_{t6}$	74.50	8.061	1.464	2.018	5.7	68.02
$BPVCM_{t12}$	83.93	8.699	1.503	2.226	7.7	57.21
$BPVCM_{t24}$	85.50	9.140	1.403	3.101	7.4	51.87

a) The subscript of the sample ($BPVCM_{t2\text{-}t24}$) is the different polymerization time. As a comparison, LPVCM was synthesized without VBT. b) Refractive index detector and BPVCM calibration standards were used for GPC analysis of the LPVCM with PS as standard, THF as eluent (elution rate was 1 mL/min), whereas a light scattering detector was used for each branched copolymer. c) $[\eta]$ donates for online viscosity detector under 25 °C.

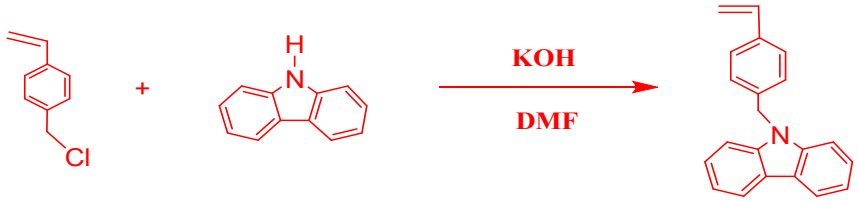

Fig. S1. The schematic illustration of synthesis of monomer VCz.

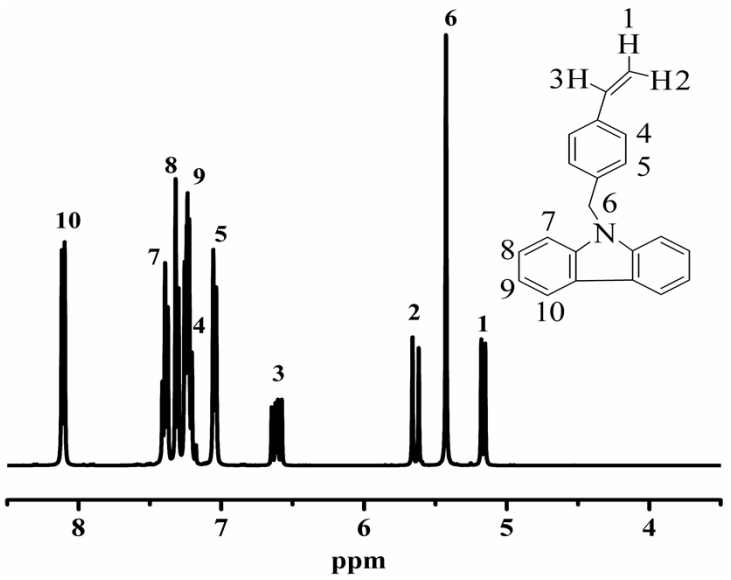

Fig. S2. ^{1}H NMR spectrum of the monomer VCz in $CDCl_3$.

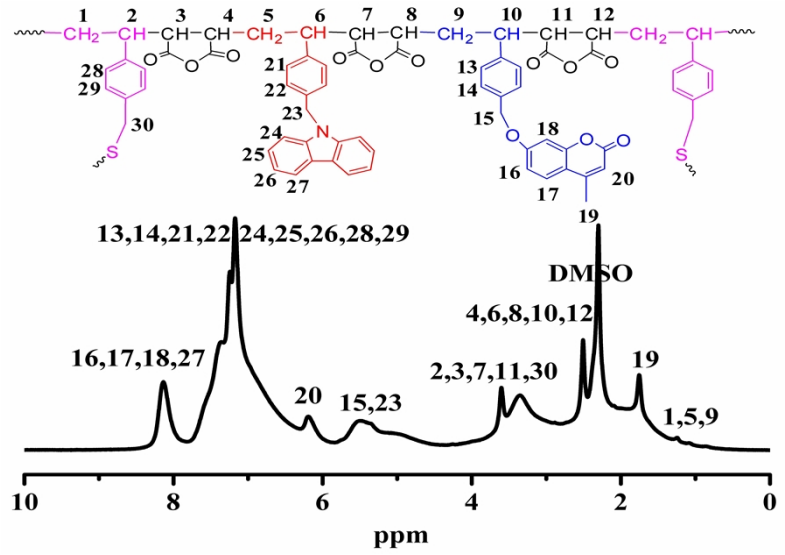

Fig. S3. ^{1}H NMR spectrum of the copolymers BPVCM in DMSO-d_6.

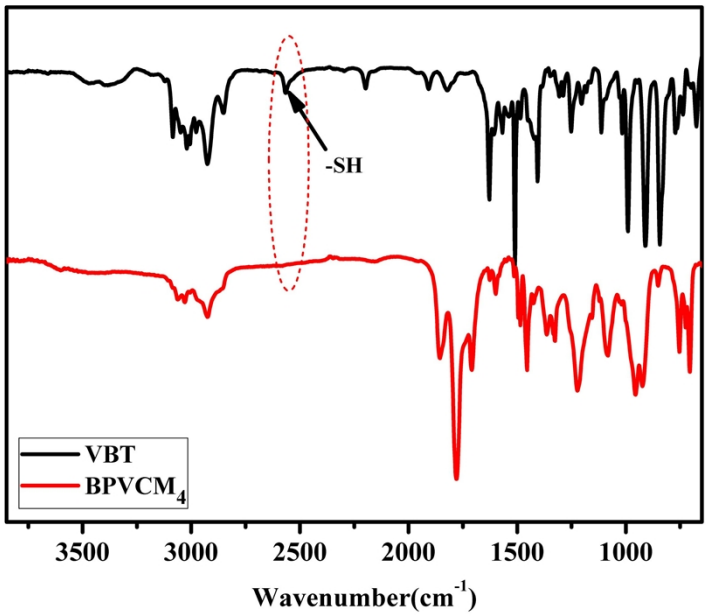

Fig. S4. FTIR spectra of BPVCM and the monomer VBT.

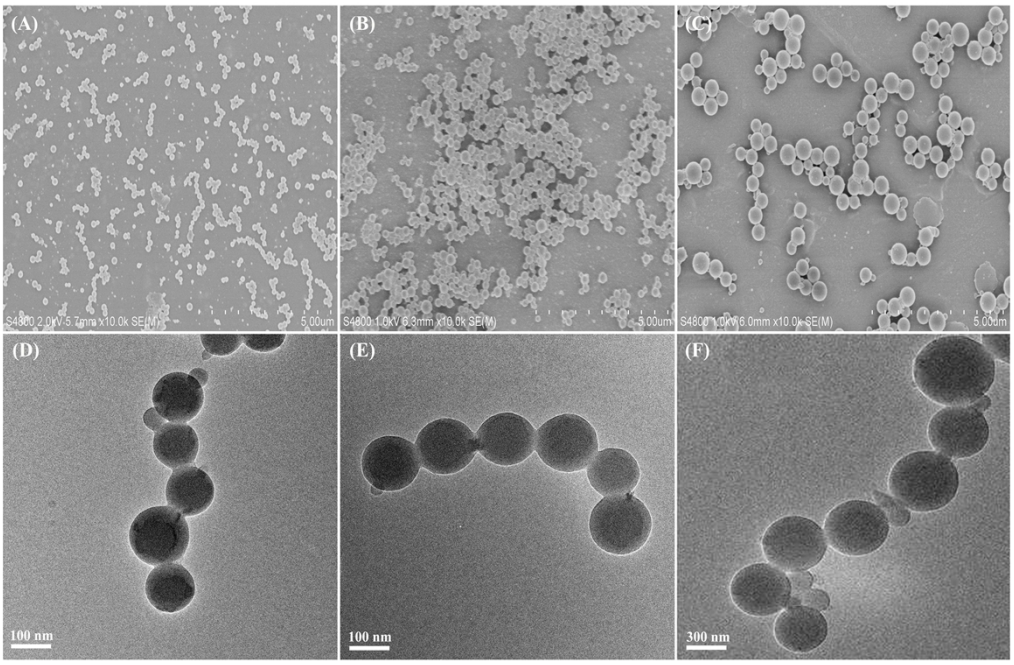

Fig. S5. SEM (A, B, C)and TEM (D, E, F) images of self-assembled micelles of copolymer $BPVCM_4$. The concentration is 0.2 mg/mL for A and D, 0.5 mg/mL for B and E, 1.0 mg/mL for C and F, respectively.

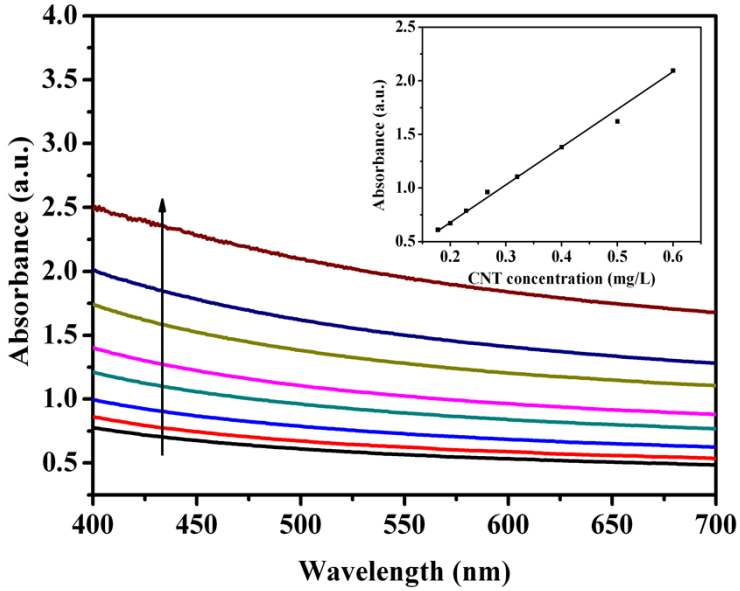

Fig. S6. UV-vis absorption spectra of BPVCM functionalized MWCNTs aqueous dispersion with different concentrations. The arrow direction exhibits the increasing direction of concentration. Inset: absorption intensity at 500 nm vs the concentration.

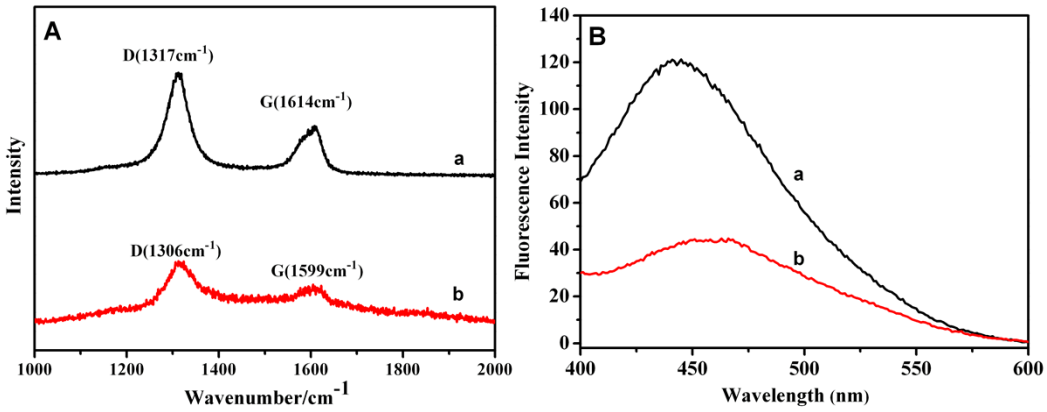

Fig. S7. Raman spectra (A) of pristine MWCNTs (a) and $BPVCM_4$ modified MWCNTs (b); Fluorescence spectra (B) of $BPVCM_4$ (a) and $BPVCM_4$ modified MWCNTs (b).

S4 References for the Supporting Information

1 Y. Liu, N. Li, X. Xia, Q. Xu, J. Ge and J. Lu, *Materials Chemistry and Physics*, 2010, 123, 685-689.