Supporting information

Combining mussel-inspired chemistry and the Michael addition reaction to disperse carbon nanotubes

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1. Materials and methods

1.1 Materials and characterization

Multi-walled carbon nanotubes (CNTs) with diameter 30-50 nm were purchased from Sinonano (Beijing, China). The as-received CNTs was used without further treatment. Dopamine hydrochloride was obtained from sangon Biotech Co., Ltd. (Shanghai, China). 3-mercapto-1-propanesulfonic acid sodium salt (MPS), normal dodecanethiol (NDM) and other chemical agents were obtained from commercial routes were of at least analytical grade and used without further purification.

The Fourier transform infrared (FT-IR) spectra were obtained in a transmission mode on a Perkin-Elmer spectrum 100 spectrometer (Waltham, MA, USA). Typically, 4 scans at a resolution of 1 cm^{-1} were accumulated to obtain one spectrum. Transmission electron microscopy (TEM) images were recorded on a Hitachi 7650B microscope operated at 80 kV; the TEM specimens were made by placing a drop of the nanoparticle ethanol suspension on a carbon-coated copper grid. Thermal gravimetric analysis (TGA) was conducted on a TA instrument Q50 with a heating rate of 20 °C/min. Samples weighing between 10 and 20 mg were heated from 25 to 600 °C in air flow (60 mL/min), N_2 as the balance gas (40 mL/min). Each sample was ultrasonicated for 30 min prior to analysis. The reported values are the mean values of three measurements. Raman spectra of CNT nanoparticles were conducted on a RM 2000 microscopic confocal Raman spectrometer (Renishaw PLC, England) employing a 514.5 nm laser beam. The X-ray photoelectron spectra (XPS) were performed on a VGESCALAB 220-IXL spectrometer using an Al Kα X-ray source (1486.6 eV). The energy scale was internally calibrated by referencing to the binding energy (Eb) of the C1s peak of a carbon contaminant at 284.6 eV.

1.2 Synthesis of CNT-PDA

CNT-PDA was prepared according to our previous method. Briefly, 600 mg of CNTs was added into 60 mL of tris(hydroxymethyl) aminomethane (Tris) solution (10 mmol/L, pH = 8.5) and then sonicated for 10 min. Then 600 mg of dopamine was added and the mixture was magnitically stirred at room temperature for 2 h. the PDA coated CNTs was obtained by centrifuged at 8000 rpm for 5 min. The finally product was divided into three equal parts.

1.3 Synthesis of CNT-PDA-MPS/NDM

To obtained CNT-PDA-MPS or CNT-PDA-NDM, CNT-PDA was first dispersed in 60 mL of NaOH aqueous solution (pH > 12). And then 400 mg of MPS or 400 μL of NDM were added into the mixture and further reacted overnight at room temperature. CNT-PDA-NDM and CNT-PDA-MPS were collected followed by centrifugation, washing and drying. Both the pristine and functionalized CNTs were characterized by a series of techniques.

2. Results and discussion

Fig. S1 Water stability of CNTs (left) and CNT-PDA (right) after deposition for 1 h.

Table S1 Detailed information of CNT nanoparticles based on Raman spectra

	Peak of G band (cm^{-1})	Peak of D band (cm^{-1})	ID/IG
CNTs	1581.6	1350.9	0.61
CNT-PDA	1581.7	1352.7	0.59
CNT-PDA-MPS	1584.2	1353.1	0.66
CNT-PDA-NDM	1584.0	1353.1	0.63

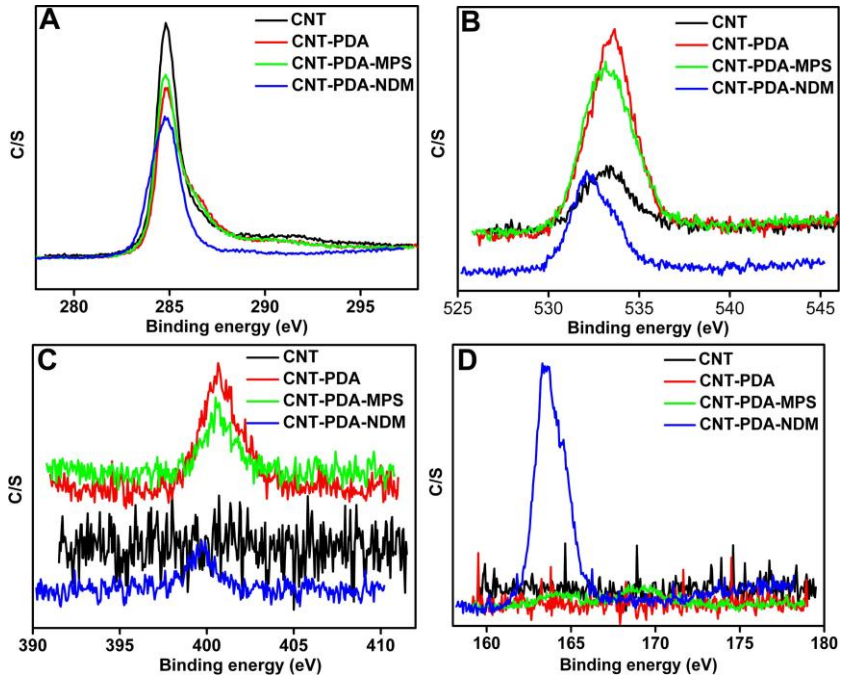

Fig. S2 XPS spectra of CNTs, CNT-PDA, CNT-PDA-MPS, CNT-PDA-NDM. (A) The carbon 1s region, (B) the oxygen 1s region, (C) the nitrogen 1s region and (D) the Sulfur 2p region.