Supporting Information

Layer-by-layer polyelectrolyte assisted growth of 2D ultrathin MoS_2 nanosheets on various 1D carbons for superior Li-storage

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Supplementary experimental details

Characterization Methods: SEM images were obtained using Hitachi S-8010 equipment operated at 15 kV. TEM images and EDX spectra were obtained using FEI Tecnai G-20 microscope. The ultrathin sections of 1D materials for TEM characteration were obtained using Gatan 691 precision ion polishing system. XRD patterns were collected using PANalytical X'Pert PRO MRD diffractometer with Ni-filtered Cu Kα radiation. TG analysis was carried out using a SEIKO TG/DTA 7300 thermal analyzer. Zeta potentials were measured by dispersing the samples in DMF/H_2O mixture with a concentration of 1 mg mL^{-1} using Zeta potential analyzer (Zetasizer Nano ZS-90, Malvern, UK).

Electrochemical Testing: The working electrode slurry was prepared by dispersing the active materials, Super P-Li, and poly(vinylidene fluoride) (PVDF) binder in N-methylpyrrolidone with a weight ratio of 7/2/1. The slurry was spread onto copper foil disks and dried in a vacuum oven at 120 °C overnight. The mass loading of electrode material on each copper disk (diameter: 13 mm) is about 1.5 mg, which equals to a mass density of 1.13 mg cm^{-2}. Lithium foil as the counter electrode, 1.0 M $LiPF_6$ in ethyl carbonate/dimethyl carbonate (1:1 v/v ratio) as the electrolyte, and Celgard 2500 as the separator, were used to assemble CR2032 coin cells. Galvanostatic discharge and charge tests were performed with a cycle tester Land 2001 from LAND Electronic Co. The cut-off potential window during charge/discharge was set between 3.0 and 0.01 V. CV curves were obtained using a CHI 760D electrochemical workstation at the scan rate of 0.1 mV s^{-1}.

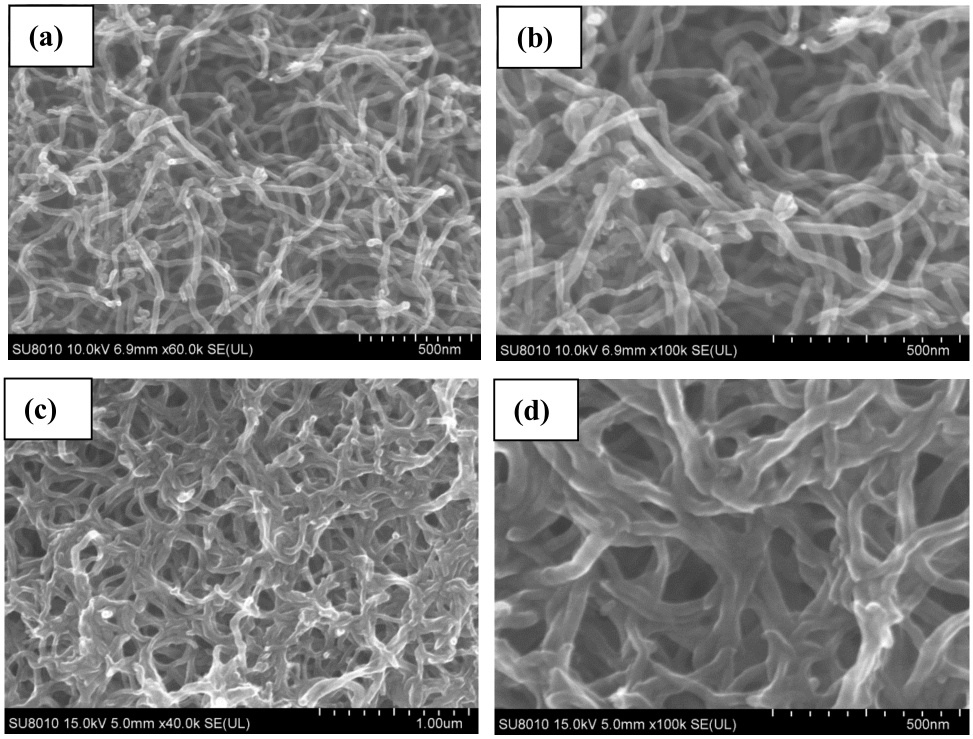

Figure S1 SEI images of (a,b) pristine CNTs and (c,d) PDDA/PSS/PDDA polyelectrolytes-coated CNTs at different magnifications.

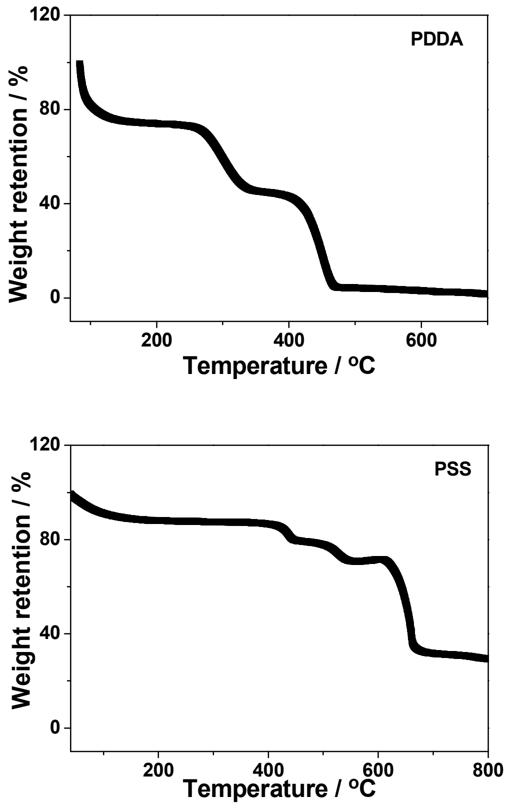

Figure S2 TG curves of pure PDDA and PSS under the atmosphere of Ar.

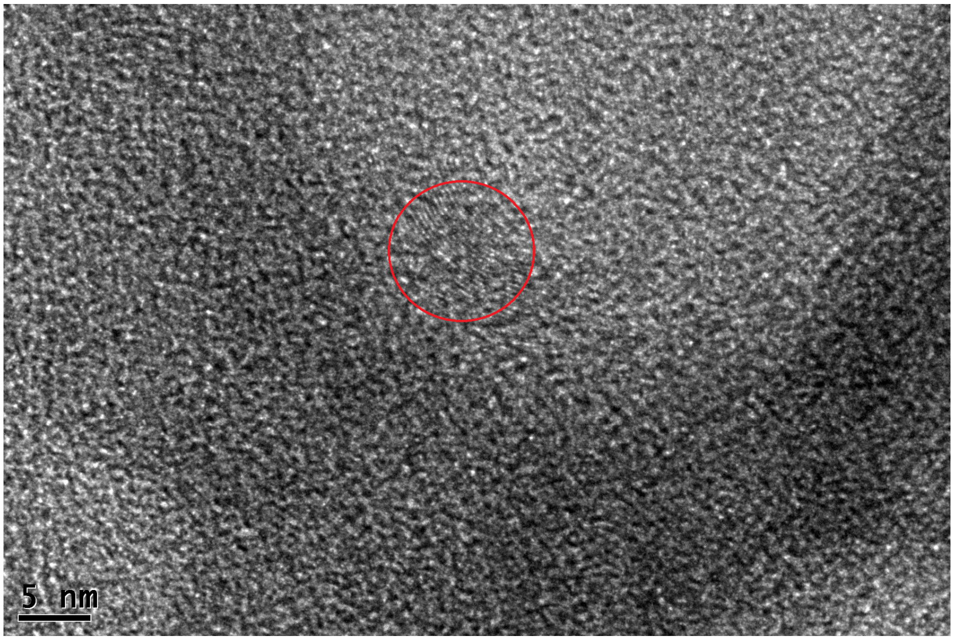

Figure S3 One high-resolution TEM image of CNTs@MoS_2 taken at the cross-section of CNTs@MoS_2.

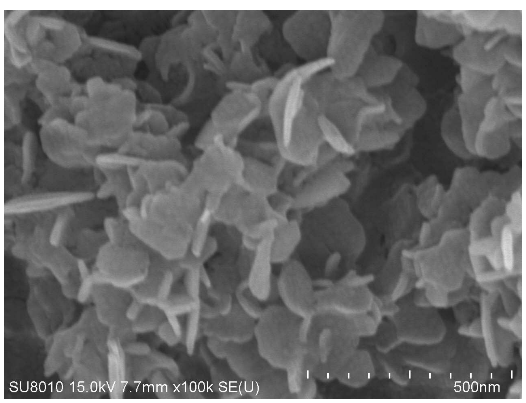

Figure S4 SEM image of bulk MoS_2.

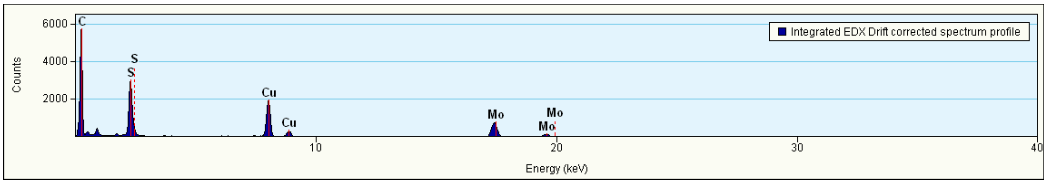

Figure S5 EDX elemental analysis of CNTs@MoS_2.

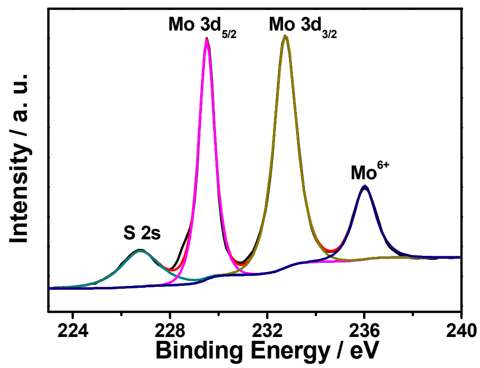

Figure S6 Deconvoluted XPS spectra of CNTs@MoS_2 in the core level region of Mo.

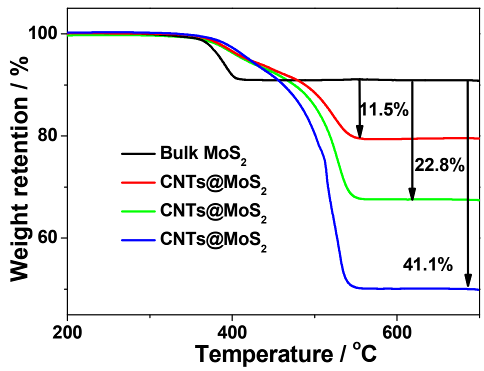

Figure S7 TG curves of CNTs@MoS_2 hybrids with different contents of MoS_2, showing that the weight percentage of MoS_2 is 59%, 77%, and 88%, respectively.

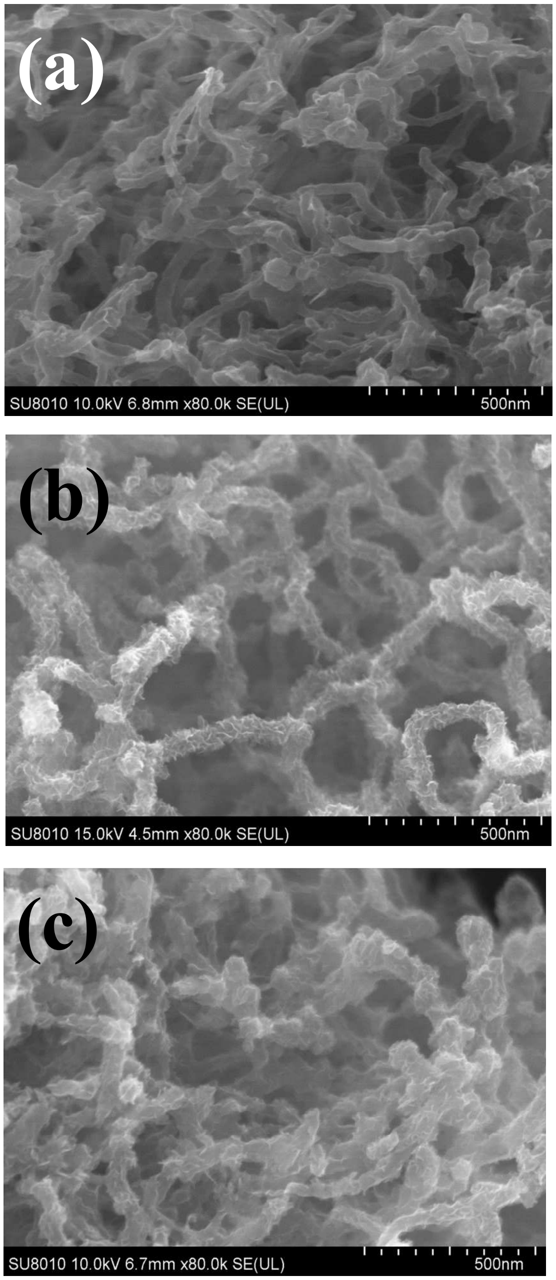

Figure S8 SEM images of CNTs@MoS_2 hybrids with different contents of MoS_2 (a) 59%, (b) 77%, (c) 88%.

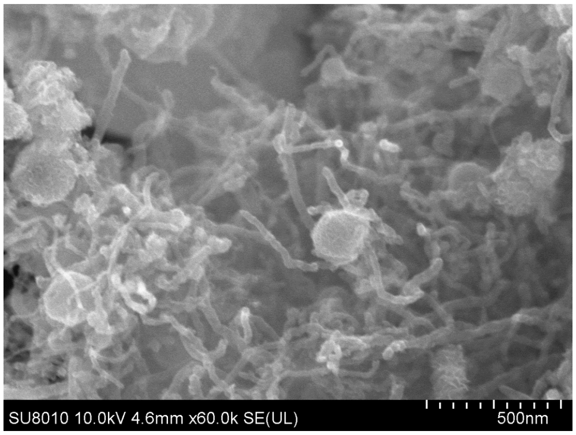

Figure S9 SEM image of CNTs/MoS_2 composite prepared with pristine CNTs.

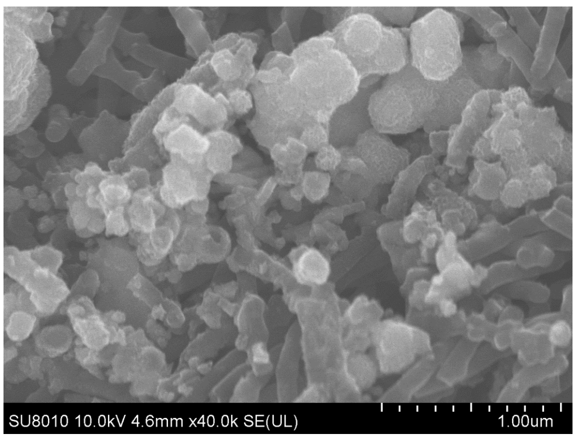

Figure S10 SEM image of CNFs/MoS_2 composite prepared without the assistance of polyelectrolyte.

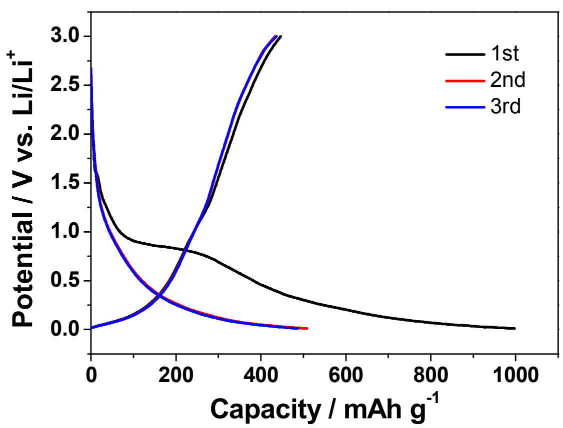

Figure 11 The initial three discharge/charge curves of pure CNTs at a current rate of 0.1 C (1C=372 mA g^{-1}).

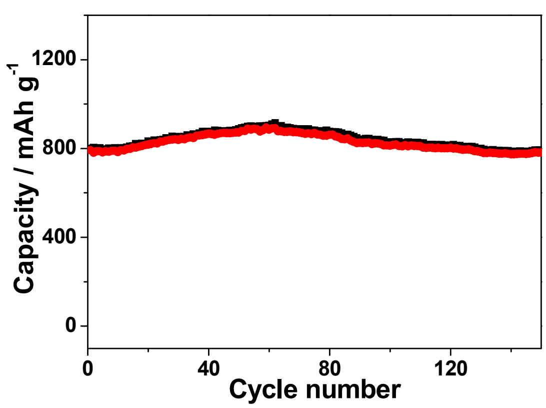

Figure S12 Capacity evolution of CNTs@MoS_2 at a constant rate of 1C.

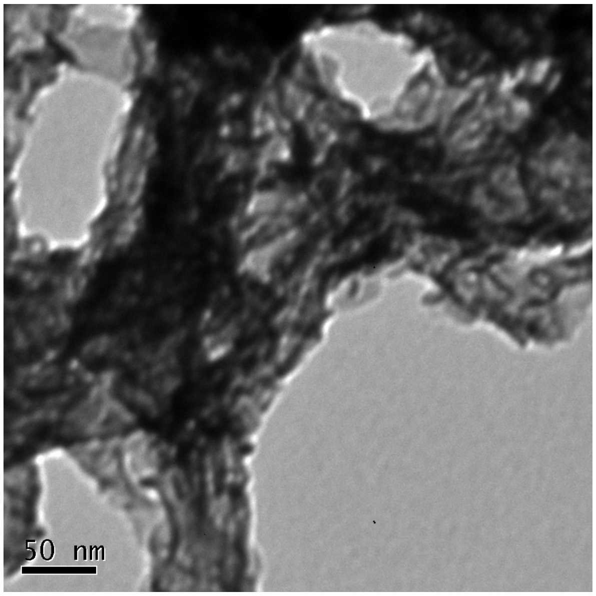

Figure S13 TEM image of CNTs/MoS_2 after 150 cycles.