Supplementary Information for

$MoSe_2$ Nanosheets Grown on Carbon Cloth with Superior Electrochemical Performance as Flexible Electrode for Sodium Ion Batteries

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Experimental Section:

Synthesis of $MoSe_2$/CF and pure $MoSe_2$ samples: A typical procedure is described as follows: a given amount of $(NH_4)_2MoO_4$ (0.5 mmol) and selenium powder (1.0 mmol) was added in 18 mL mixture of oleic acid and ethanol (volume ratio=1:1) in an 20 mL Teflon-lined autoclave. A piece of carbon cloth (1 cm × 1 cm) was then put into the autoclave. The autoclave was sealed and heated at 180 °C for 72 h in an oven, and then cooled down to room temperature. The products were collected and washed several times with ethanol. To remove the organic residue and excess selenium powder, the as-prepared products were annealed in Ar/H_2 (95%:5%) at 300 °C for 2 h. Other $MoSe_2$/CF samples have also prepared in different conditions (Table 1). Pure $MoSe_2$ was also prepared under the same condition without carbon cloth.

Electrochemical Measurements for Sodium Ion Battery: The electrochemical test of $MoSe_2$/CF were carried out using CR2032 coin-type cells, consisting of a $MoSe_2$/CF electrode and sodium metal anode separated by a glass fiber. The $MoSe_2$/CF were

used as anode electrodes directly and the weight of $MoSe_2$ were calculated by using the weight of $MoSe_2$/CF to minus the weight of carbon cloth. The electrode of pure $MoSe_2$ was prepared by milling a mixture of 70wt% active materials, 20wt% acetylene black and 10wt% poly(vinyl difluoride) (PVDF) in N-methylpyrrolidinone (NMP) to from a homogeneous slurry. The slurry of the mixture was pasted uniformly on a Cu foil current collector and the electrode was then dried under vacuum at 110 °C for 12 h before cell assembly. The cells were assembled in a glove box filled with dried argon gas. The electrolyte was a mixture of ethylene carbonate and dimethyl carbonate 1:1 (w/w) containing 1 M $NaClO_4$ and 5 wt% flouroethylene carbonate additive.

To investigate electrochemical performance, cyclic voltammetry (CV) and charge/discharge measurements were carried out on a CHI660D electrochemistry workstation and Land Battery Measurement System at room temperature. The electrochemical performance was conducted at various current densities in the voltage range of 0-3 V. Cyclic voltammetry (CV) studies were carried out between 0 and 3 V at scans rate of 0.2 mV s^{-1}.

Characterizations: TEM images were acquired by a Hitachi HT-7700 transmission electron microscope (TEM, Japan) operating at 100 kV. High-resolution TEM (HRTEM) micrographs were obtained with a Philips Tecnai F20 FEG-TEM (The USA) operated at 200 kV. Samples for TEM analysis were prepared by drying a drop of cyclohexane solution containing the nanomaterials on the surface of a carbon-coated copper grid. The XRD patterns were obtained using a Rigaku D/MAX-RB with monochromatized Cu Kα radiation (λ=1.5418 Å) in the 2θ

ranging from 10° to 80°. X-ray photoelectron spectra (XPS) were conducted using a PHI Quantera SXM instrument equipped with an Al X-ray excitation source (1486.6 eV). Binding energies (BEs) are referenced to the C 1s of carbon contaminants at 284.6 eV. The electrochemical performances of samples were carried out on a CHI660D electrochemistry workstation and Land Battery Measurement System at room temperature.

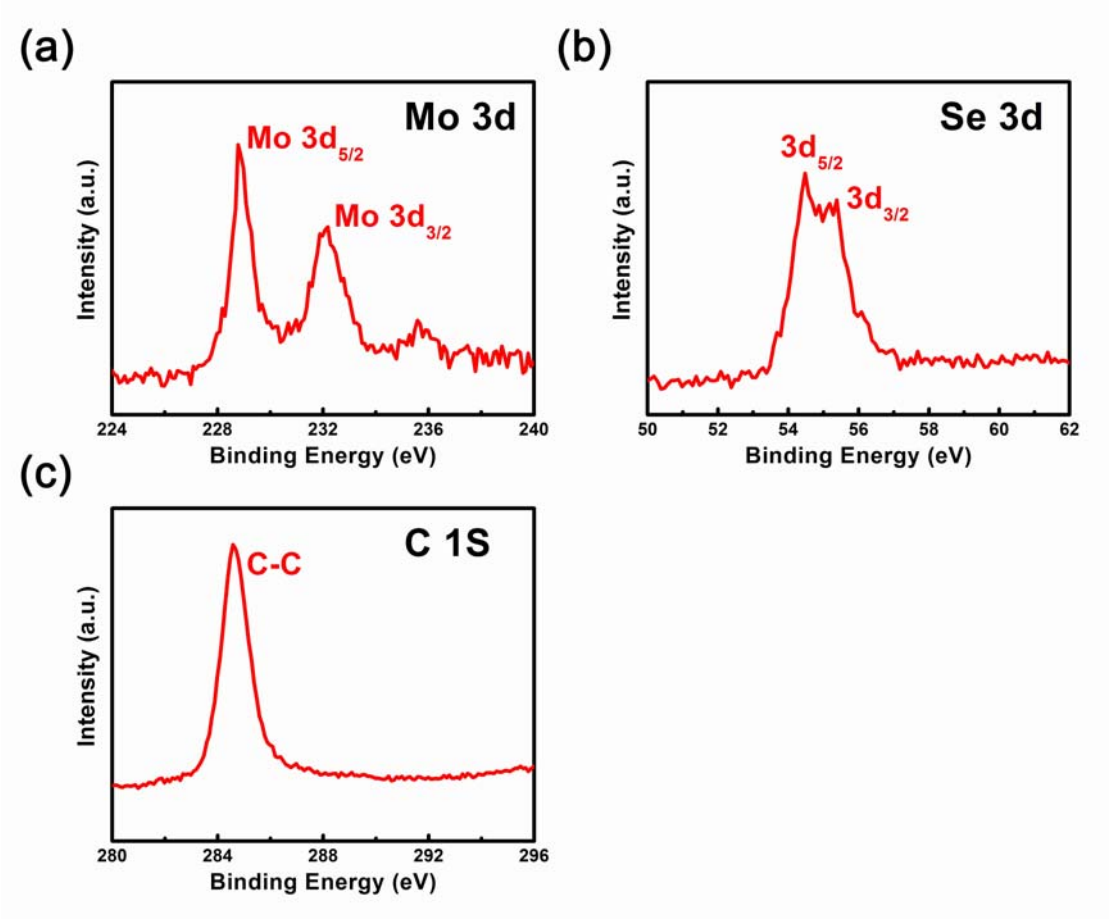


Fig. S1 XPS of the $MoSe_2$/CF sample.

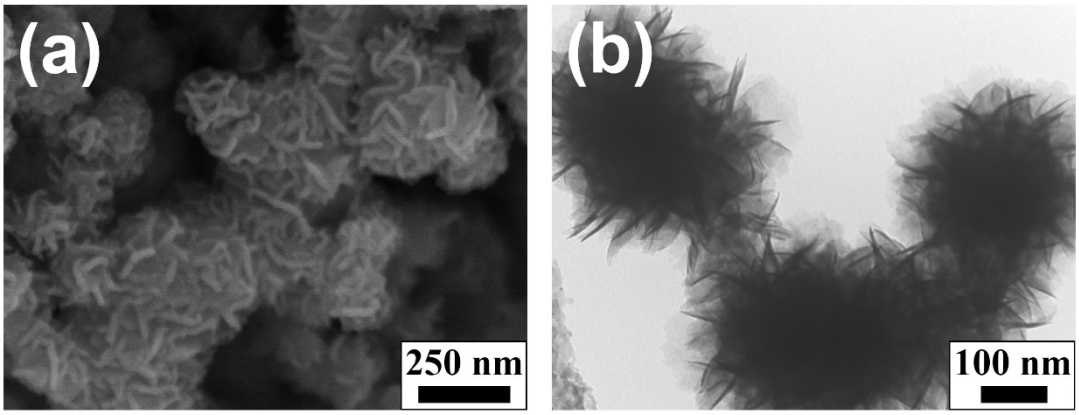


Fig. S2 SEM and TEM images of the pure $MoSe_2$ sample.

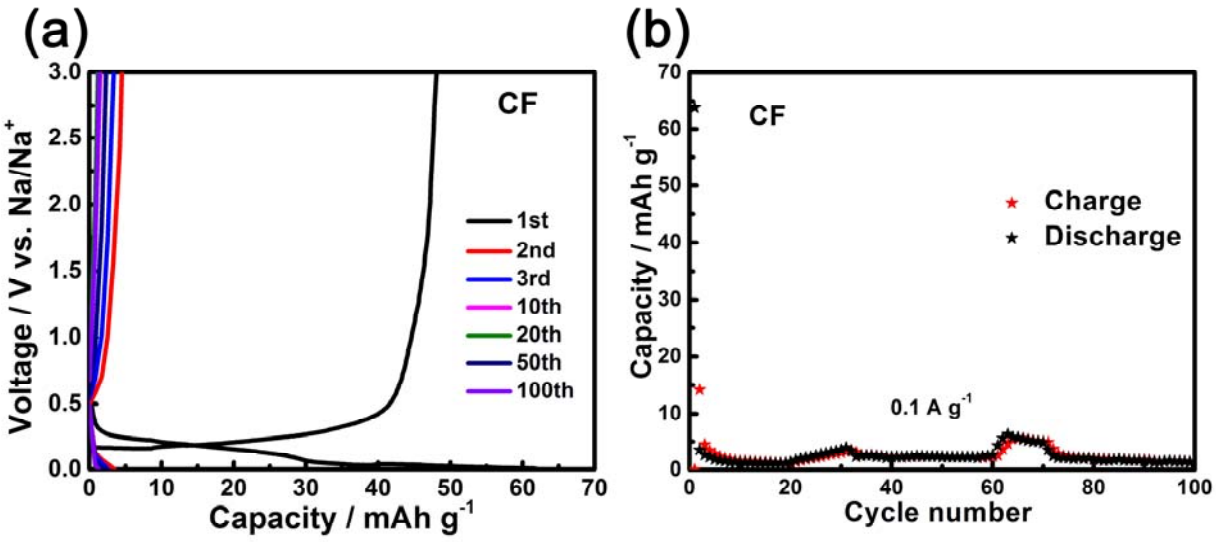


Fig. S3 Charge/discharge curve and cycling stability of CF sample.

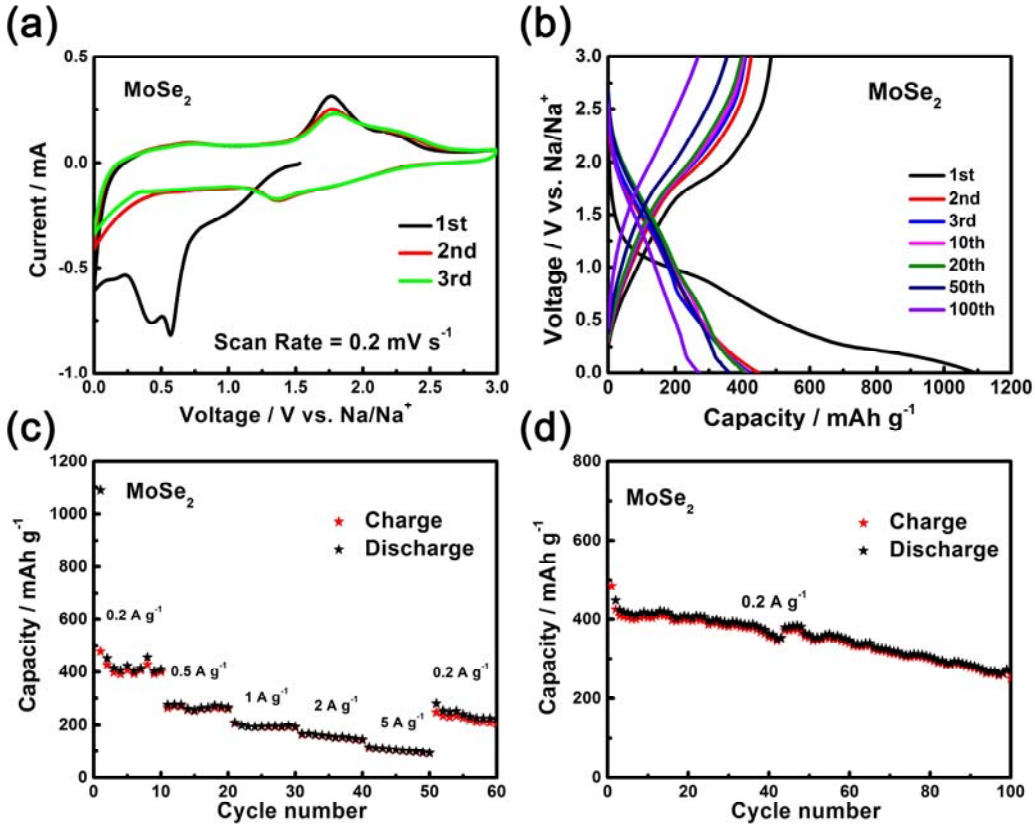


Fig. S4 Electrochemical performance of the pure $MoSe_2$ sample.

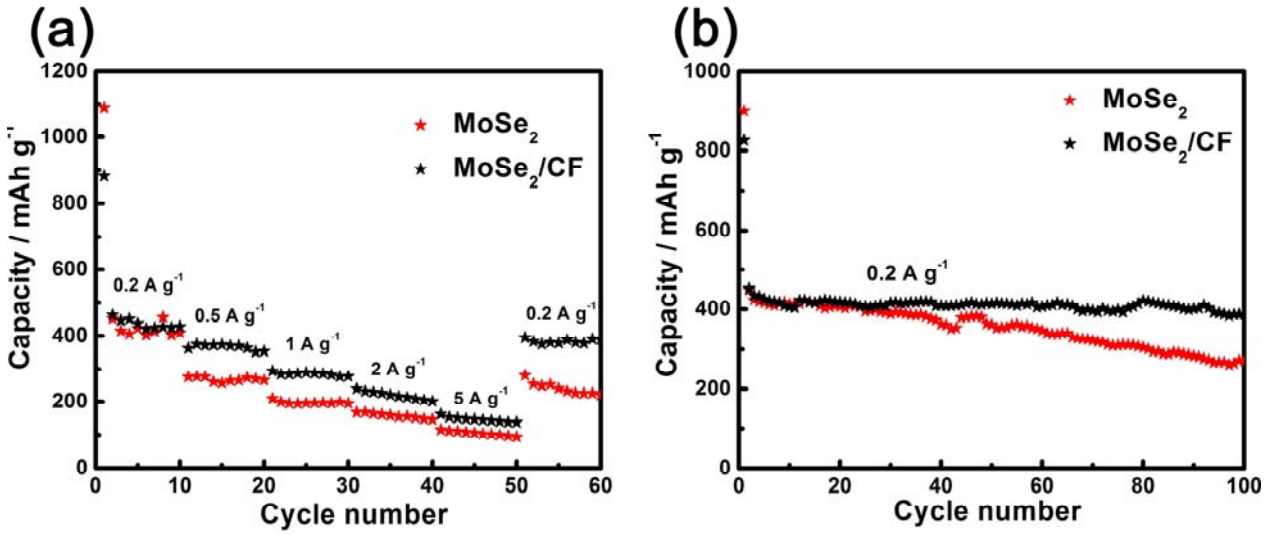


Fig. S5 Rate ability and cycling stability of $MoSe_2$/CF and pure $MoSe_2$.

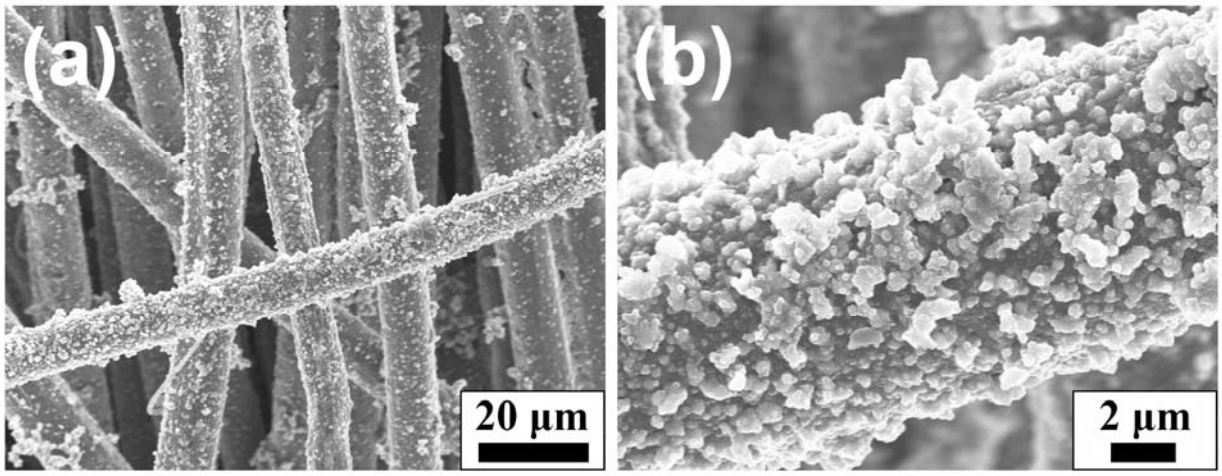
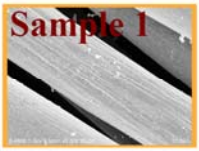
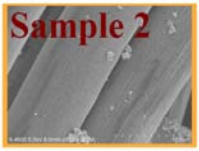


Fig. S6 SEM images of $MoSe_2$/CF sample after 100 cycles at 0.2 A g^{-1}.

Table 1 The morphology of $MoSe_2$/CF prepared by different conditions.

$(NH_4)_2MoO_4$	Se powder	Carbon cloth	$MoSe_2$/CF	Loading mass of $MoSe_2$	Morphology
0.25 mmol	0.5 mmol	12.3 mg	14.2 mg	1.9 mg	
0.5 mmol	1mmol	12.2 mg	14.8 mg	2.6 mg	
1mmol	2mmol	12.3 mg	15.3 mg	3.0 mg