Supplementary Information

Compact graphene/MoS$_2$ composite films for highly flexible and stretchable all–solid–state supercapacitors

Ning Li, Tian Lv, Yao Yao, Huili Li, Kai Liu, Tao Chen*

School of Chemical Science and Engineering, Institute of Advanced Study, Shanghai

Key Lab of Chemical Assessment and Subsustainability, Tongji University, Shanghai, 200092, China. E-mail address: tchen@tongji.edu.cn.
**Fig. S1** (a,b) SEM images of as-grown graphene foam after removed Ni substrate with different magnifications. (c,d) TEM images of bare graphene.

**Fig. S2** Cross-sectional SEM images of as-synthesized bare graphene and graphene/MoS$_2$ foams.
**Fig. S3** TEM images of MoS$_2$ nanosheets. Inset in (a) showed the electron diffraction pattern.

**Fig. S4** (a, b) Digital photographs of dry graphene foam before (a) and after (b) pressing. (c, d) Digital photographs of dry graphene foam before (c) and after (d) pressing from side view.
**Fig. S5** I–V curves of baregraphene film and with graphene/MoS$_2$ composite film. The effective length of samples measured was 2 cm.

**Fig. S6** (a) CV curves of an all–solid–state supercapacitor based on graphene/MoS$_2$ composite films with 35.0 wt% of MoS$_2$ at various scanning rates. (b) GCD curves of the supercapacitor measured under different charge–discharge currents.
**Fig. S7** Nyquist plots of supercapacitors based on graphene/MoS$_2$ composite films with different MoS$_2$ contents (0, 2.4, 14.8, 25.4, 35.0, 44.1, and 68.3 wt%) recorded in a frequency range from $10^{-2}$ to $10^5$ Hz.

**Fig. S8** Cycling performance of supercapacitors based on bare graphene and graphene/MoS$_2$ composite films.
**Fig. S9** (a) CV curves of one single supercapacitor and four supercapacitors connected in series at the scan rate of 0.1 V/s. (b) Galvanostatic charge–discharge curves of one single supercapacitor and four supercapacitors connected in series at a constant charge – discharge current of 1.0 mA. (c) Digital photograph of four supercapacitors connected in series to power a red LED.

**Fig. S10** Digital photographs of a supercapacitor being stretched from 0 to 60% strain.
**Fig. S11** Normalized specific capacitance of a supercapacitor based on graphene/MoS$_2$ composite films as a function of tensile strains.

**Fig. S12** (a) Dependence of series resistances of a graphene/MoS$_2$-based supercapacitor on the bending cycles. (b) Dependence of series resistance of a graphene/MoS$_2$-based supercapacitor on the stretching cycles to tensile strain of 30%.
Fig. S13 SEM images of graphene/MoS$_2$ composite film before (a) and after (b) stretched.