Electronic Supplementary Information

Core-Shell Structured CeO$_2$@MoS$_2$ Nanocomposites for High Performance Symmetric Supercapacitor

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Chemicals. Cerium (III) nitrate hexahydrate (Ce(NO$_3$)$_3$$\cdot$6H$_2$O, 99.99 %, Sigma-Aldrich), tetraethylorthosilicate (Si(OC$_2$H$_5$)$_4$, 98 %, Acros Organics), sodium molybdate (Na$_2$MoO$_4$$\cdot$2H$_2$O, 99 %, Fluka), thioacetamide (CH$_3$CSNH$_2$, 98 %, Sigma-Aldrich), 1-ethyl-3-methylimidazolium tetrafluoroborate (Emim(BF$_4$), C$_6$H$_{11}$BF$_4$N$_2$, 98%, Energy Chemical), sodium sulfate (Na$_2$SO$_4$, 99%, Energy Chemical). Ammonium hydroxide (NH$_3$$\cdot$H$_2$O, 25 %), absolute ethanol (C$_2$H$_6$O, 99.7 %), sodium hydroxide (NaOH, 96 %) and ethylene glycol (C$_2$H$_6$O$_2$) were purchased from Tianjin Zhiyuan Chemical Company. All chemicals were used without any further purification. Deionized water was used throughout this study.
**Figure S1.** TEM image of pure MoS$_2$ nanosheets.

**Figure S2.** The electrochemical performance of CeO$_2$ porous hollow spheres in a two-electrode cell with aqueous electrolyte (1M Na$_2$SO$_4$). (a) The galvanostatic charge-discharge profiles of CeO$_2$ hollow spheres at the applied current of 2 mA (The active electrodes area was ca. 0.785 cm$^2$). (b) Cyclic voltammetry plots of CeO$_2$ hollow spheres at the scan rate of 100 mV s$^{-1}$.
Figure S3. EIS Nyquist plots of CeO$_2$@MoS$_2$ nanocomposites, CeO$_2$ hollow spheres and MoS$_2$ nanosheets with aqueous electrolyte (1M Na$_2$SO$_4$). We used AUTOLAB electrochemistry workstation to test the impedance of CeO$_2$@MoS$_2$ nanocomposites, CeO$_2$ hollow spheres and MoS$_2$ nanosheets. As shown in Figure S3, Nyquist plots revealed the charge-transfer resistance ($R_{ct}$) for CeO$_2$@MoS$_2$ nanocomposites was the smallest compared with pure MoS$_2$ nanosheets and CeO$_2$ hollow spheres, indicating a smaller reaction resistance and hence a better performance for supercapacitor with aqueous electrolyte (1M Na$_2$SO$_4$) for CeO$_2$@MoS$_2$ nanocomposites.