Electronic Supplementary Information

A Facile and green strategy for the synthesis of MoS_2 nanospheres with excellent Li-ion storage properties

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Experimental Details

Synthesis of MoS_2 nanospheres: 6 mmol of sodium molybdate dihydrate were dissolved in 50 ml deionized (DI) water for 2 min. Then, 25 mmol of L-cysteine was added to the solution followed by sonication for 30 min. Next, 10 M HCl was added to the solution drop by drop until the pH value of the solution was less than 1. After 15 min of stirring, the mixture was transferred into a Teflon-lined stainless steel autoclave and reacted at 220 °C for 36 h. After the autoclave cooled down to room temperature, the product was washed with DI water and absolute ethanol several times, and then dried at 80 °C for 12 h. Finally, the product was annealed at 800 °C for 2 h in an atmosphere of H_2 (5%) and balanced by N_2 to obtain high-crystallinity products and remove impurities.

Chracterizations: X-Ray powder diffraction (XRD) patterns were obtained on a Bruker D-5005 with Cu Kα radiation (λ = 1.5406 Å) at 40 kV and 40 mA with a scan rage of 5°~65°. Sample morphologies were characterized by carrying out field emission scanning electron microscopy (FE-SEM, Hitachi S-4800). A JEM-2010 transmission electron microscope (TEM) equipped with a field emission gun and operated at 200 kV was used for high-resolution TEM measurements.

Electrochemical measurements: The prepared MoS_2 nanospheres and nanosheets were mixed with polyvinylidene fluoride and Super P in a weight ratio of 70: 15: 15. This resulting mixture was dispersed in *N*-methyl pyrrolidone. The obtained slurry was casted on copper foil and dried in oven. The electrode was pressed to enhance the particle contact. The 2016 coin-type cells were assembled in argon filled glove box. Lithium foil was used as counter and reference electrodes and 1.0 M $LiPF_6$ dissolved in a mixture of ethylene carbonate and diethyl carbonbate (1:1 in volume ratio) was used as electrolyte. The voltage window for electrochemical testing was between 0.01 and 3.0 V versus Li/Li^+.

Cyclic voltammetry (CV) was carried out at a scan rate of 0.1 mVs^{-1}. All electrochemical measurements were made at room temperature with a WBCS3000 cycler (WonA Tech, Korea).

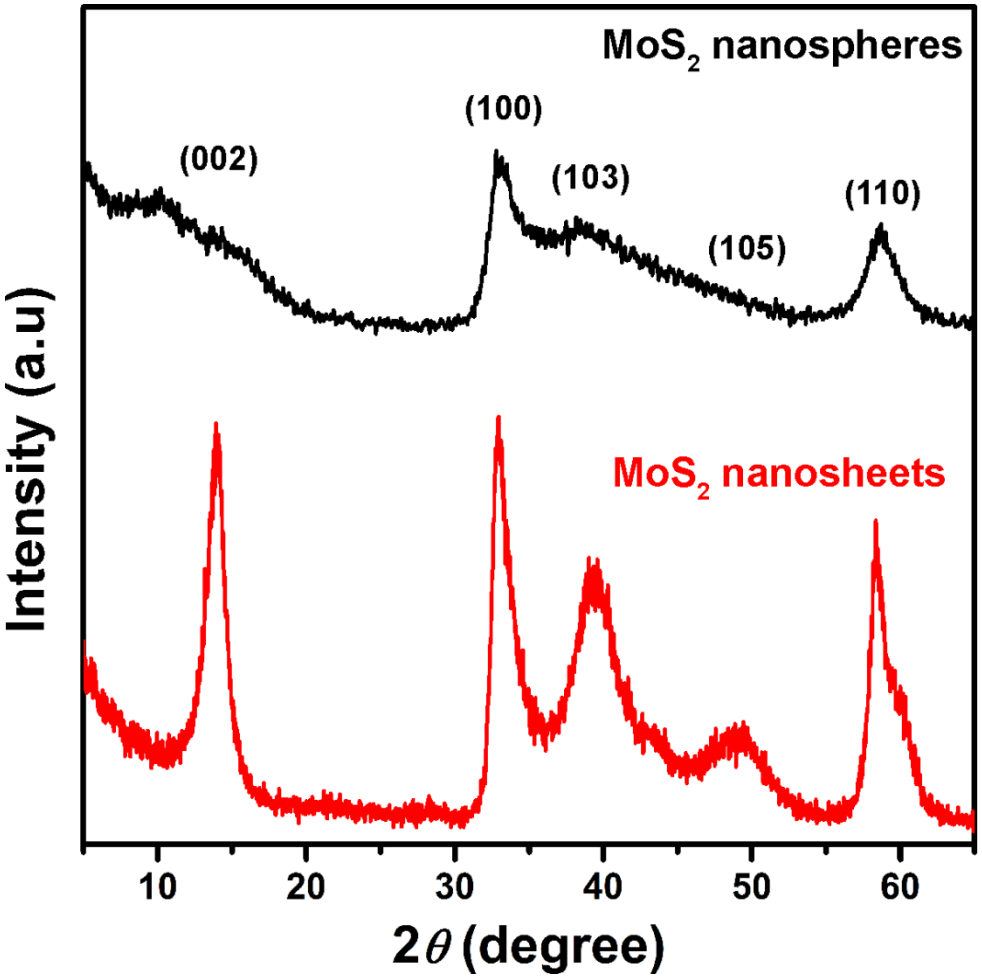

Fig. S1 XRD patterns of MoS_2 nanospheres and nanosheets (MoS_2 nanospheres and nanosheets were annealed at 800 °C for 2 h in an atmosphere of H_2 (5%) and balanced by N_2 to obtain high-crystallinity products and remove impurities).

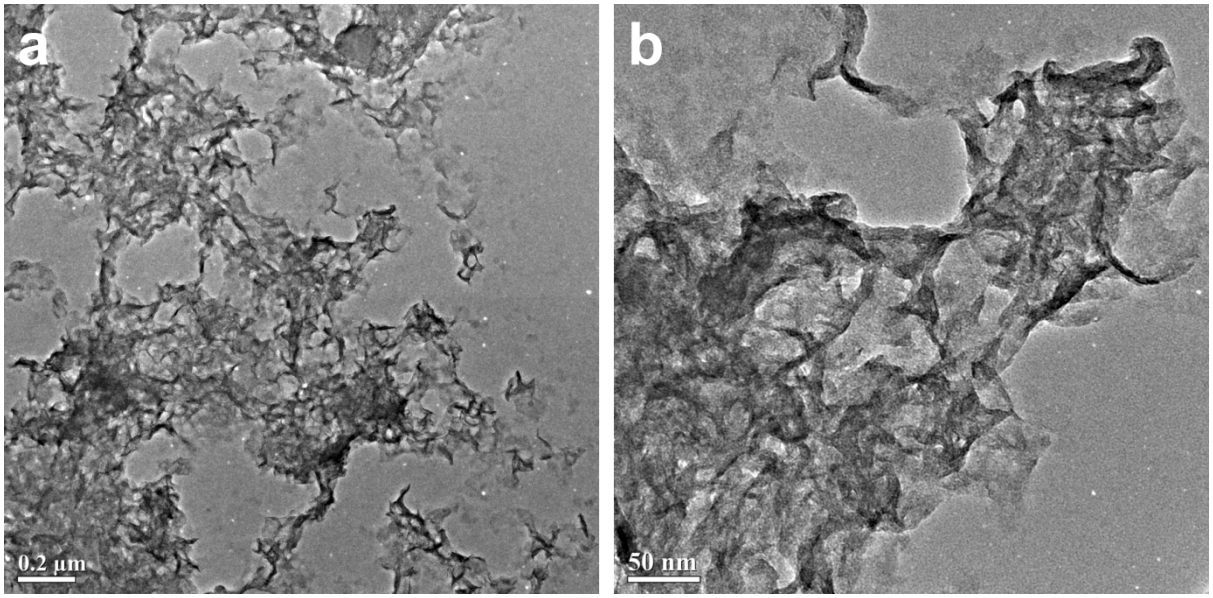

Fig. S2 TEM images of the MoS_2 synthesized in the solution with the pH of 7.