Supporting information

Optimization of Mesoporous Carbon Structures for Lithium-Sulfur Battery Applications

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Supplementary figures.

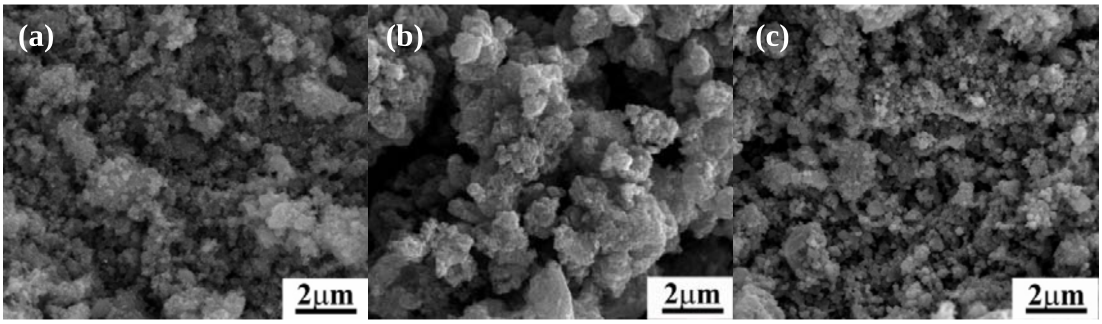

Fig. S1 SEM images of MC22 and MC22-S composites. (a) As-synthesized MC22; (b) MC22-83 (83 wt.% sulfur loading) after wet impregenation with sulfur-CS_2 solution and 155 °C annealing; (c) MC22-50 (50 wt.% sulfur loading) after wet impregenation with sulfur-CS_2 solution and 155 °C annealing.

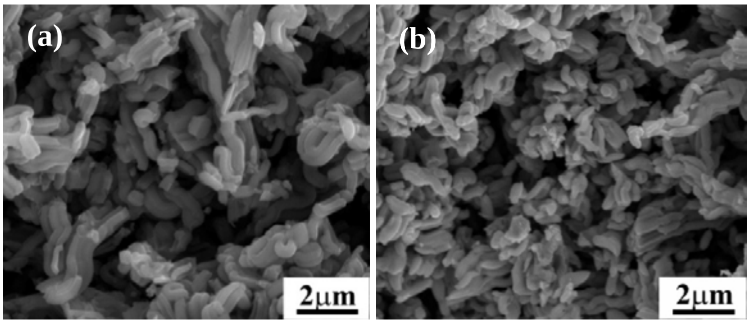

Fig. S2 SEM images of CMK3 and CMK3-S composites. (a) As-synthesized CMK3; (b) CMK3-56 (56 wt.% sulfur loading) after wet impregenation with sulfur-CS_2 solution and 155 °C annealing.

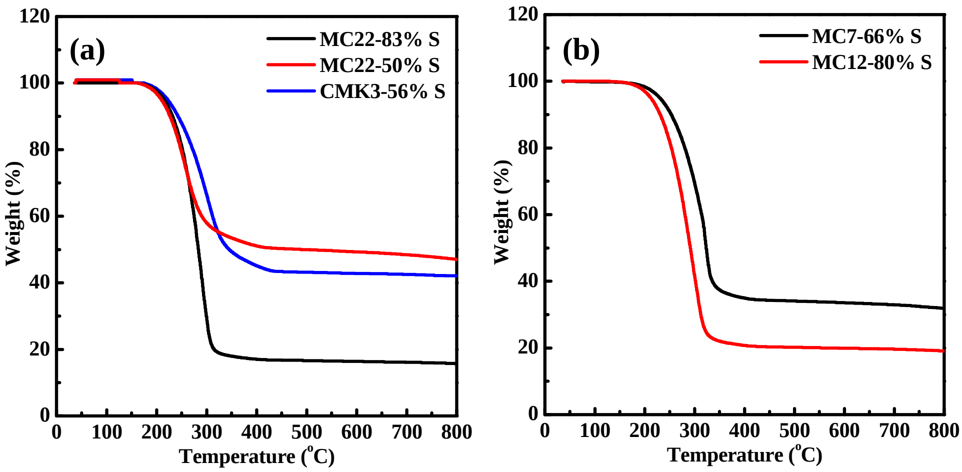

Fig. S3 TGA curves of MCS composites recorded under nitrogen with a heating rate of 10 °C/min.

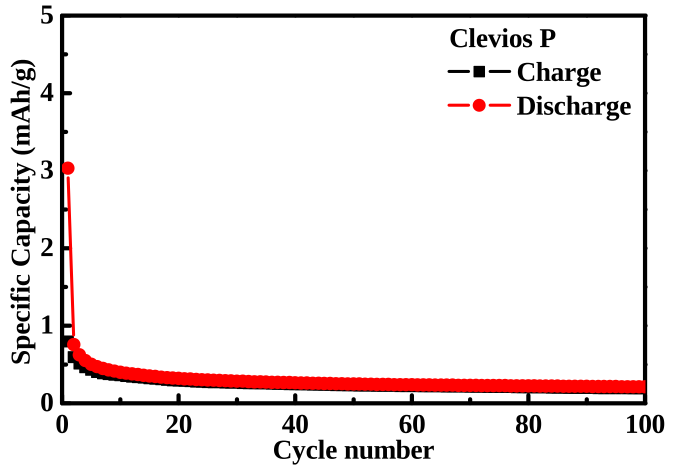

Fig. S4 Cycling data of a Clevios P electrode between 1.0 V - 3.0 V at a charge/discharge current density of 5 mA/g. The electrode was made by pasting the slurry that mixed 90 wt.% Clevios P with 10 wt.% carbon black on an Al foil. Electrochemical tests were performed using coin cells with Clevios P cathode and lithium metal as the counter and reference electrode. The electrolyte was 1 M LiTFSI in DOL and DME (1:1 by volume). A microporous membrane (Celgard 2400) was used as the separator. The galvanostatic charge-discharge test was conducted at a voltage interval of 1.0 V - 3.0 V using a BT-2043 Arbin Battery Testing System. Clevios P itself has almost no capacity between 1.0 V to 3.0 V.

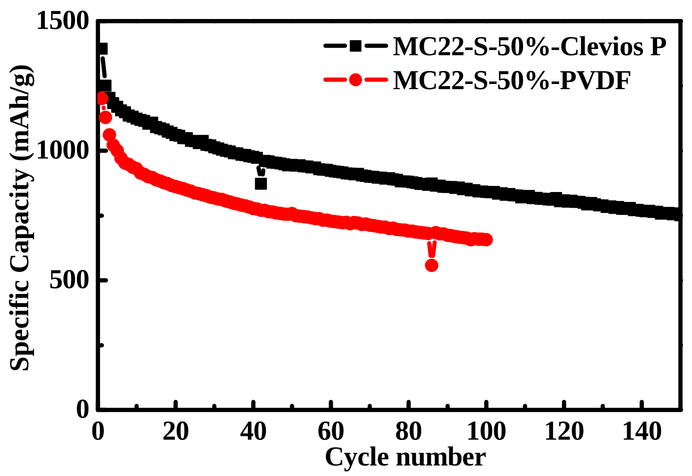

Fig. S5 Long term cycle stability of MC22-50 composite electrodes using Clevios P and PVDF, respectively, as binders.

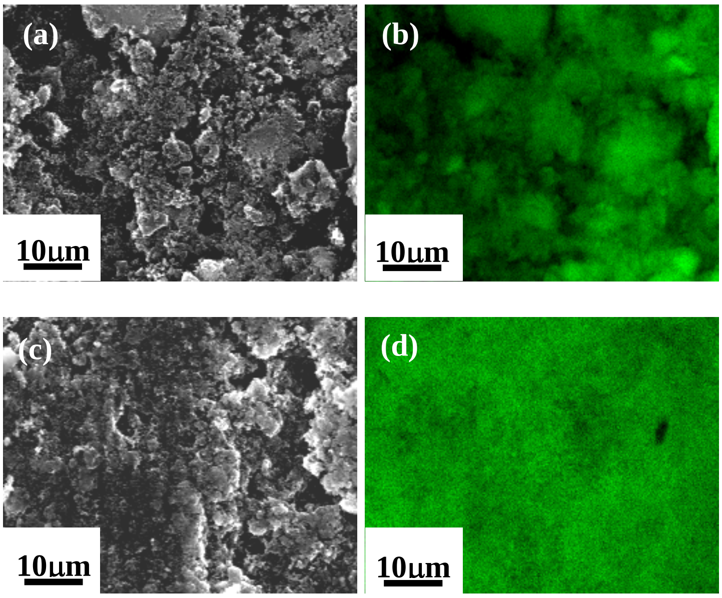

Fig. S6 SEM images and S elemental mapping results of the MC22-50-Clevios P electrode before and after cycling. (a) SEM image of the MC22-50-Clevios P electrode before cycling. (b) S elemental mapping of the MC22-50-Clevios P electrode before cycling. (c) SEM image of the MC22-50-Clevios P electrode after 100 cycles. (d) S elemental mapping of the MC22-50-Clevios P electrode after 100 cycles.

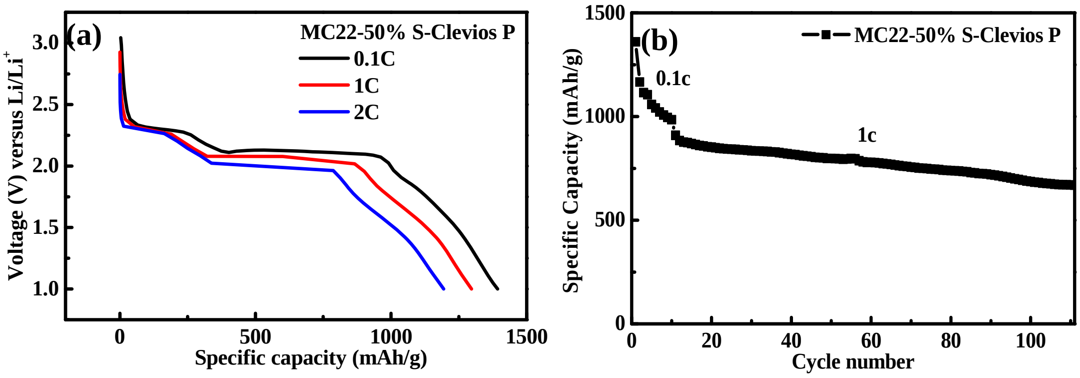

Fig. S7 Rate performance of MC22-50-Clevios P electrodes. a) First cycle discharge curves of MC22-50-Clevios P electrodes at different current densities of 168 mA/g (0.1C), 1680 mA/g (1C), and 3340 mA/g (2C) respectively. b) Long term cycling of a MC22-50-Clevios P electrode after a 110 cycle test under different charge-discharge current densities of 168 mA/g (0.1C) and 1680 mA/g (1C) respectively.