

Fabrication of three-dimensional ordered macroporous spinel  $\text{CoFe}_2\text{O}_4$  as efficient bifunctional catalysts for the positive electrode of lithium-oxygen batteries

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In this work, three-dimensionally ordered macroporous (3DOM)  $\text{CoFe}_2\text{O}_4$  (CFO), which consist of macroporous channels, were prepared for the bifunctional catalysts of Li-O<sub>2</sub> battery positive electrodes. For the preparation of 3DOM CFO, polystyrene colloidal crystals were used as the templates enabling the pore sizes to be tailored to allow an investigation into the effects of morphological changes on the electrochemical properties. The as-prepared O<sub>2</sub>-electrode of 3DOM CFO catalyst with a pore diameter of 140 nm (3DOM CFO@140) catalyst shows a high initial discharge capacity (ca. 11658.5 mAh g<sup>-1</sup>) and high rate capability. Furthermore, the Li-O<sub>2</sub> cell with 3DOM CFO@140 has high cyclability for more 47 cycles under a limited capacity (up to 500 mAh g<sup>-1</sup>) with a reduced overpotential (1.13 V), as compared with that with pure ketjen black carbon and 3DOM CFO catalyst with a pore diameter of 60 nm (3DOM CFO@60). From the view of their unique structure and high Li<sup>+</sup> storage performance, the 3DOM CFO catalysts prepared here could be a promising O<sub>2</sub>-electrode catalyst for Li-O<sub>2</sub> batteries.