Preparation of Mesoporous Carbon with different Pore Wall structure via a temperature-programmed route for Lithium Sulfur Battery

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Due to the high specific surface area and large pore volume, mesoporous carbon materials are appealing for research interests to promote the performance of Lithium sulfur battery (Li/S). Herein, a mesoporous carbon (MC-1000) material, with high specific surface area ($1432 \text{ m}^2 \text{ g}^{-1}$) and large pore volume ($2.894 \text{ cm}^3 \text{ g}^{-1}$), is prepared via situ template method (using MgO as template), followed by pyrolysis at 1000°C in nitrogen atmosphere. Temperature-programmed route is used to regulate the pore wall of MC-1000, and the modified MC-1000, MC-1300 and MC-1600 with similar specific surface area and pore volume are chosen for investigating the effect of micro-structure of MC on the performance of Li/S battery. HR-TEM images show graphited structure gradually formed with the regulated progress, and the increasing of pyrolyzation temperature may also improve the conductivity of MC and MC/S composites. With an appropriate sulfur loading, MC-1300 and MC-1600 both present superior discharge capacity. Notably, MC-1300 and MC-1600 display high capacity of 1524 mAh g^{-1} and 1415 mAh g^{-1} , respectively, which is close to the theoretical specific capacity of sulfur.

Keywords: mesoporous carbon, pore wall, shuttle effect, lithium sulfur, large pore volume

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