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Carbon Nanotube Doped with Gaseous-phase Silica/Sulfur Composite as a Cathode Material for High-performance Lithium–Sulfur Batteries

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Despite its high theoretical specific capacity and energy density, lithium–sulfur battery (Li–S) can be practically used only when the shuttle effect and insulation property of elemental sulfur are addressed. In this regard, carbon nanotubes (CNTs) doped with gaseous-phase silica/sulfur composite ($GPSiO_2$-CNTs/S-*X*) at different mass ratios are synthesized through solid-state fusion method and used as cathode for Li–S cells. Results show that $GPSiO_2$-CNTs/S cathode with a mass ratio of 3:1:7 can maximize the duration of the discharge platform. In addition, a high initial discharge capacity of 1508 mAh g^{-1} is obtained at 0.1 C. The excellent properties of the $GPSiO_2$-CNT/S composite can be attributed to its special 3D structure, which facilitates the reutilization of the trapped active material and considerably improves the conductivity of sulfur cathode.

Keywords: lithium–sulfur batteries; cathode material; gaseous-phase silica; carbon nanotubes

FULL TEXT