

## Synergetic Effect of Hollow TiO<sub>2</sub> -Webbed Carbon Nanotubes and a Dual functional Carbon-Paper Interlayer

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A novel nanocomposite cathode consisting of sulfur and hollow-mesoporous titania (HMT) embedded within carbon nanotubes (CNT), which is designated as S-HMT@CNT, has been obtained by encapsulating elemental sulfur into the pores of hollow-mesoporous, spherical TiO<sub>2</sub> particles that are connected via CNT. A carbon-paper interlayer, referred to as dual functional porous carbon wall (DF-PCW), has been obtained by filling the voids in TiO<sub>2</sub> spheres with carbon and then etching the TiO<sub>2</sub> template with a chemical process. The DF-PCW interlayer provides a medium for scavenging the lithium polysulfides and suppressing them from diffusing to the anode side when it is inserted between the sulfur cathode and the separator. Lithium-sulfur cells fabricated with the thus prepared S-HMT@CNT cathode and the DF-PCW interlayer exhibit superior performance due to the containment of sulfur in TiO<sub>2</sub> and improved lithium-ion and electron transports. The Li-S cells display high capacity with excellent capacity retention at rates as high as 1C, 2C, and 5C rates.