Hierarchical porous, N-containing carbon supports for high loading sulfur cathodes

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As the energy storage industry such as electric vehicles (EVs) and energy storage system (ESS) expands, they require high energy storage system (> 400 Wh/kg). However commercial lithium-ion batteries have an energy density of ~240 Wh/kg, which is less than that, and have reached the limit. Among various next-generation energy storage systems, lithium-sulfur batteries (LSBs) are promising systems. Herein, we suggest a multi-functional porous carbon, melamine cyanurate (MCA)-glucose-derived carbon (MGC), with superior porosity, electrical conductivity, and polysulfide trapping as an efficient sulfur support to make easy the redox reaction of polysulfides and mitigate the shuttle effect. To provide enough space as the carbon supports for the high loading sulfur cathode, the MGC is synthesized by a reactive templating approach, wherein 2D organic framework of MCA is utilized as pore structure directing agent. Furthermore, the MGC contains pyridinic-N atoms which has strong affinity of polysulfide, thus enabling to alleviate the shuttle effect.