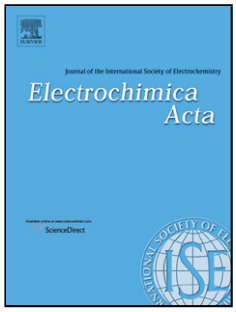

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Micro-nano structure composite cathode material with high sulfur loading for advanced lithium–sulfur batteries

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ABSTRACT

A micro-nano structure based on polydopamine-grafted hollow carbon nanofiber–sulfur composite (HCNF@PDA–S) is designed as a cathode material for effective trapping of sulfur and polysulfides for lithium–sulfur batteries. Hollow carbon nanofiber@polydopamine (HCNF@PDA) micro-nano structure hybrid is first prepared by an in-situ polymerization dopamine monomer decorating on the surface of HCNFs and then elemental sulfur is infiltrated into the HCNF@PDA hybrid nanostructure by thermal treatment. The obtained HCNF@PDA–S composite shows the micro-nano structure based on the micron-sized hollow carbon nanofiber in length and nano-sized polydopamine grafted on the outer surfaces of the HCNFs with homogeneously distribution of sulfur. Compared with the HCNF–S composite, HCNF@PDA–S composite with a high sulfur content of approximately 80 wt% exhibits better electrochemical performance, which delivers initial discharge capacity of 800 mAh g^{-1} and maintains 530 mAh g^{-1} after 200 cycles at 0.5 C rate. The enhancements of electrochemical performances may be attributed to the unique