Materials Panel Abstract & Speaker Biography

3D Nano-Architecture as New Cathode Hosts for High-Performance Lithium-Sulfur Batteries

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Lithium-sulfur batteries have been plagued for a long time due to low Coulombic efficiency, fast capacity loss, and poor high rate performance. Our focus is on the design and synthesis of various of innovative 3D nano-architectures as new cathode hosts for lithium-sulfur batteries[1-7] such as 3D hyperbranched hollow carbon nanorod architecture,[1] Poly(3,4-ethylenedioxythiophene) coated multi-chambered micro/mesoporous carbon nanocubes,[2] three-dimensional metal carbide@mesoporous carbon hybrid architecture.[3] These sulfur nanocomposite cathodes deliver a high specific capacity and exhibit stable cycling performance. Particularly, poly(3,4-ethylenedioxythiophene) coated multi-chambered micro/mesoporous carbon nanocubes-sulfur cathodes delivered a high initial capacity of 1086 mAh/g at 1C rate and long cycling life up to 1000 cycles, and the electrodes also exhibited high rate capabilities of 842 mA h/g and 530 mA h/g after 1000 cycles at 5C and 10C, respectively. The superior electrochemical performances should be ascribed to the unique nano-architectures, which can effectively prevent the dissolution of polysulfides, decrease self-discharge, and confine the volume expansion during cycling. High capacity, excellent high-rate performance, and long cycle life endow the as-developed sulfur/carbon nanocomposites promising cathode materials for lithium-sulfur batteries.

References

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Speaker Biography:

Professor Guoxiu Wang is the Director of the Centre for Clean Energy Technology and a Distinguished Professor at University of Technology Sydney (UTS), Australia. He currently holds an ARC Professorial Future Fellowship. Professor Wang is an expert in materials chemistry, electrochemistry, energy storage and conversion, and battery technologies.

His research interests include lithium-ion batteries, lithium-air batteries, sodium-ion batteries, lithium-sulfur batteries, supercapacitors, hydrogen storage materials, fuel-cells, graphene, and chemical functionalisation of graphene. Professor Wang has published more than 360 refereed journal papers with an h-index of 63. His publications have attracted over 15,000 citations (Web of Science).