Highly nitrogen and sulfur dual-doped carbon microspheres for supercapacitors

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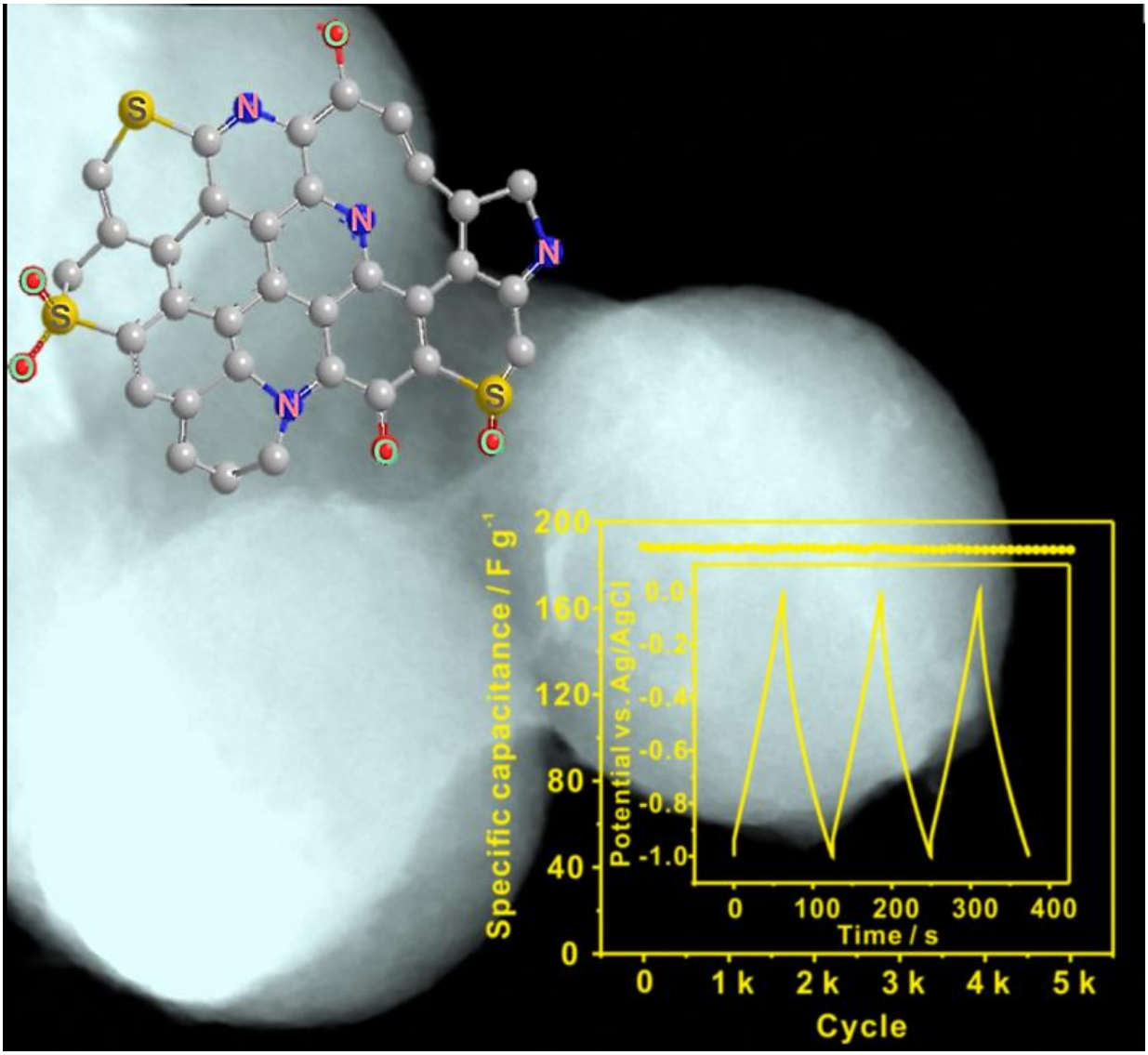

This figure shows the morphology, molecular model and cycling performance of the N/S co-doped carbon microsphere. Credit: ©Science China Press

Among electrode materials for supercapacitors, carbon-based materials are most commonly used because they're commercially available and cheap, and they can be produced with a large specific surface area. Heteroatom doping, especially dual-doped carbon materials, have attracted much attention in the past few years, and have been regarded as one of the most efficient strategies to enhance the capacitance behavior of porous carbon materials. However, most of the preparations of co-doped carbon materials involve high-temperature treatment and post-processing of doping procedures. Therefore, it is necessary to develop a concise route for large-scale production of dual-doped carbon with desirable morphology and structure and to achieve high content of doping.

In an article published in *Science Bulletin*, Prof. Deli Wang's research group describe a two-step synthetic route to fabricate N/S co-doped carbon microspheres (NSCMs) using thiourea as dopant. The N/S doping content is controlled by varying the carbonization temperature. It has been proved that a suitable quantity of N and S groups can not only provide pseudo-capacitance, but also promote the electron transfer for carbon materials, which ensures the further utilization of the exposed surfaces for charge storage.

The optimized NSCM prepared at a carbonization temperature of 800° C (NSCM-800) achieves a high capacitance of 277.1 F g^{-1} at a current density of 0.3 A g^{-1}, and a high capacitance retention of 98.2 percent after 5000 cycles. Since the precursors used in this strategy are glucose and thiourea, which are both inexpensive and widely used, the production of high-doping content of co-doped carbon materials can be easily scaled up for practical applications of supercapacitors.

More information: Wen Lei et al, Highly nitrogen and sulfur dual-

doped carbon microspheres for supercapacitors, *Science Bulletin* (2017). DOI: 10.1016/j.scib.2017.06.001