Activated carbon with hierarchically structure for ultracapacitors

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To resolve the pore-associated bottleneck problem observed in the electrode materials used for ultracapacitors, which inhibits the transport of the electrolyte ions, we designed a hierarchically structured activated carbon (HAC) by synthesizing a mesoporous silica template/carbon composite and chemically activating it to simultaneously remove the silica template and increase the pore volume. The resulting HAC had a well-designed, unique porous structure, which allowed for large interfaces for efficient electric double-layer formation. Given the unique characteristics of the HAC, we believe that the developed synthesis strategy provides important insights into the design and fabrication of hierarchical carbon nanostructures. The HAC, which had a specific surface area of 1957 m2 g^{-1}, exhibited an extremely high specific capacitance of 157 F g^{-1} (95 F cc^{-1}), as well as a high rate capability. This indicated that it had superior energy storage capability and was thus suitable for use in advanced ultracapacitors.