Fabrication of 3D hierarchical core@shell architectures as advanced electrodes for asymmetric supercapacitors

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Supercapacitors (SCs) have attracted much attention as energy storage devices due to their high power density, fast charge/discharge capability, long cycling life, and eco-friendliness. Particularly, designing proper hierarchical free-standing core@shell architecture based electrode materials by assimilating two different types of nanostructured pseudocapacitive materials on a three-dimensional conductive substrate can significantly improve the conductivity, ion-accessible electroactive surface area, and flexibility, resulting in improved energy-storage performance. To better understand the core@shell structure, this work compares the synthesis methods, material category, and morphology between the different core@shell structures as well as their electrochemical performances for the corresponding SCs. By understanding the details of the core@shell architectures, more rational design regarding the choices of material category and morphology can be achieved, and therefore better electrocapacitive performance for the resulting SCs can be realized.