Modification of carbon-based electroactive materials for supercapacitor applications

ABSTARCT

Relentless efforts have been underway to improve the energy storage capability and cyclic stability of supercapacitors without sacrificing their shelf life. Supercapacitors, also known as electrochemical capacitors, can deliver significantly more power than batteries or fuel cells, making them indispensable in high power density applications. The selection of electroactive materials for supercapacitors is attributed to the high specific capacitance of supercapacitors. Activated carbon and carbon nanotubes have been widely explored as electroactive materials in supercapacitor applications because of their unique combination of features, which include a high surface area, high electrical conductivity, controlled pore size distribution, and excellent electrochemical properties. Recently, graphene has attracted tremendous interest for supercapacitor research because of its exceptionally high charge carrier mobility, high conductivity, excellent mechanical properties, high surface area, good chemical stability, and great flexibility compared to other carbon-based materials. Therefore, this chapter discusses different types of carbon-based materials that have been studied as electroactive materials for the electrodes of supercapacitors, along with their electrochemical performances (i.e., specific capacitance, retention value, and impedance) in supercapacitor applications.