Flexible solid supercapacitors with high capacitance using an amphiphilic graft copolymer

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A bendable and scalable solid supercapacitor with high capacitance was fabricated based on dual-functional role of an amphiphilic graft copolymer, poly(vinyl chloride)-*graft*-poly (oxyethylene methacrylate) (PVC-*g*-POEM). Organized mesoporous TiN (om-TiN) films were synthesized by the PVC-*g*-POEM template and preformed TiO_2 nanoparticles through calcination under NH_3 condition. Due to large surface area, high porosity, and well-interconnected structure, the capacitance of the solid supercapacitor with om-TiN was improved up to 128.5 F g^{-1}. Also, the incorporation of a small quantity (2 wt%) of carbon nanotubes further increased the high conductivity and surface area, enhancing the capacitance (213.6 F g^{-1}). Moreover, the large scale (15 x 15 cm) of solid supercapacitor with good bendability was successfully fabricated. The PVC-*g*-POEM graft copolymer with high mechanical strength and high flexibility also served as a solid electrolyte for solid supercapacitor, and it showed better performance (266.8 F g^{-1}) compared to solid supercapacitor with a conventional electrolyte.