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Fabrication of three-dimensional composite textile electrodes by metal-organic framework, zinc oxide, graphene and polyaniline for all-solid-state supercapacitors

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ABSTRACT: Textile electrode materials have attracted intense attention in the flexible supercapacitor field due to their flexibility, light weight, hierarchical porosity and mechanical robustness. However, their electrochemical performance is not good due to the low conductivity, ineffective ion diffusion and small electroactive surface area. In this study, a three-dimensional (3D) textile electrode material was constructed by utilizing ZIF-8 (Zeolitic Imidazolate Framework), metal oxides, conductive polymers and graphene sheets. The polyaniline/ZnO/ZIF-8/graphene/polyester textile electrode exhibited good electrochemical performance with a high areal capacitance of 1.378 F/cm^2 at 1 mA/cm^2 and high stability under different mechanical deformations. A flexible all-solid-state symmetric supercapacitor device was further fabricated, which can provide a high energy density of $235 \text{ } \mu\text{Wh/cm}^3$ at a power density of $1542 \text{ } \mu\text{W/cm}^3$.

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