Effect of Graphene Quantum Dots on the Capacitance Performances of flexible PEDOT: PSS films

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Supercapacitors are promising energy storage and power output technologies that can be used for practical energy conversion and storage devices are still urgently needed. Here, we prepared a free-standing flexible PEDOT:PSS/GQDs composite films, which contains PEDOT:PSS and variable contents GQDs, by a facile vacuum filtration method. And then the capacitance performance of PEDOT:PSS/GQDs films were systematically investigated and compared with pure PEDOT:PSS by cyclic voltammetry (CV), galvanostatic charge/discharge, and electrochemical impedance spectroscopy (EIS) measurements. These results show that the capacitance performance of the PEDOT:PSS/GQDs composites film incorporating GQDs components is improved in the H₂SO₄ (1 M) electrolyte system under applied potential window (-0.2-0.8 V) as shown in the following aspects. The as-prepared films show excellence redox performance and rate capability, and the specific capacitance of film calculated by the galvanostatic charge/discharge curves reaches the maximum 21.5 mF cm⁻² at 20 wt.% GQDs composition compared to the prepared pure PEDOT:PSS (17.5 mF cm⁻²). Moreover, it displays excellent capacitance retention well over 84% of the initial value over 13500 consecutive charging/discharging cycles in air atmosphere, suggesting that PEDOT:PSS/GQDs film based on PEDOT:PSS and GQDs components have improved capacitive performance through the addition of high performance GQDs, which will provide important reference value for novel supercapacitor electrode materials.

Keyword: PEDOT:PSS; GQDs; Supercapacitors; Composite film; Organic polymer

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