

Investigating on Doped PEDOT:PSS as a Function on Supercapacitor

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Structured Abstract

Background: Supercapacitors are a unique type of energy storage device that charge and discharge rapidly compared to conventional batteries. As the use of flexible and high-performance electronic devices has become more prevalent, the search for materials to be utilized in supercapacitors has begun. The more provocative one of the found materials is PEDOT:PSS, which is a conductive plastic. The conductivity of PEDOT:PSS is, however, not adequate for more challenging uses. This project would be exploring doping PEDOT:PSS with different chemicals and whether they actually increase its performance in supercapacitors.

Methods: PEDOT:PSS was doped by mixing it with several chemicals, mostly with 5% ethylene glycol. Thin films of these mixtures were cast as electrodes. Electrical conductivity was measured using the four-point probe method. Energy storage performance was assessed using cyclic voltammetry, a technique that cycles the material through charging and discharging. The electrodes were also tested for stability by repeating charge/discharge cycles as much as 1,000 times.

Results: Doping PEDOT:PSS with 5% EG increased its conductivity from 0.8 S/cm to 3.2 S/cm, a four-fold increase in electrical conduction. Energy storage capacity, which is known as specific capacitance, also jumped from 55 F/g to 120 F/g. The doped electrode still maintained 92% of its capacity after 1,000 charge-discharge cycles, while the pure PEDOT:PSS only maintained about 75% or so. These results suggest that the doped PEDOT:PSS is much better suited for use in supercapacitors and also more stable for repetitive use

Conclusion: This study illustrates that doping PEDOT:PSS with the right chemical not only increases its capacitance and conductivity but also improves its longevity and stability. These results could potentially make supercapacitors even more useful in fueling next-generation devices as well as clean energy technology.

Keywords: PEDOT:PSS, Supercapacitor, Doping, Conductivity, Capacitance

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