

PEDOT:PSS-based current collectors for Flexible and stretchable Li-ion batteries

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Currently, there is increasing interest in replacing relatively heavy metal current collectors with light-weight substrates for flexible energy storage devices in Li-ion batteries. Stretchable conductive materials are an essential component to replace inflexible metal current collectors. Among them, the use of a conductive polymer film such as PEDOT:PSS as a substrate has advantages such as high flexibility, availability, and safety as well as light and inexpensive raw materials. In this study, PEDOT:PSS nanofibers were fabricated by electrospinning for a stretchable LIB. The conductivity of PEDOT:PSS was improved by adding DMSO, a dopant with a high dielectric constant. The structure of the stretchable nanofiber PEDOT:PSS demonstrated stability and conductivity. In addition, by using a PEDOT:PSS substrate as an electrode current collector, the mass loading per volume of the electrode was lowered to show a high energy density. The prepared PEDOT:PSS current collector exhibited low sheet resistance even at low volume per mass loading. The mechanism and manufacturing method of the nanofibers, and the electrochemical properties of the stretchable battery were investigated in detail.