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Investigation of the electrospun carbon web as the catalyst layer for vanadium redox flow battery

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Abstract

Polyacrylonitrile (PAN) carbon nonwoven web consisting of 100 - 200 nm ultrafine fibers has be developed by electrospinning and subsequent carbonization process at 1000 ^{o}C for different times. The surface morphology, composition, structure, and electrical conductivity of the electrospun carbon webs (ECWs) as well as their electrochemical properties toward vanadium redox couples have been characterized. With the increasing of carbonization time, the electrochemical reversibility of the vanadium redox couples on the ECW is enhanced greatly. As the carbonization time increases up to 120 min, the hydrogen evolution is facilitated while the reversibility is promoted a little bit further. The excellent performance of ECW may be attributed to the conversion of fibers carbon structure and improvement of electrical conductivity. Due to the good electrochemical activity and freestanding 3-dimensional structure, the ECW carbonized for 90 min is used as catalyst layer in vanadium redox flow battery (VRFB) and enhances the cell performance.

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