APLICATION OF MULTISTEP ELECTROSPINNING METHOD FOR PREPARATION OF EDLC HALF-CELL AND ITS LOW TEMPERATURE PERFORMANCE

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It is well-known that in order to increase the electrical double-layer capacitor (EDLC) performance the porous structure, thickness, wettability and the mass transfer rate of ions in mircomesoporous carbon material, depends on the electrode preparation method [1]. Our motivation for this work was to develop new electrode preparation method with what we could be able to prepare carbon electrodes with lower density and thickness than conventional electrodes prepared applying traditional roll-pressing method.

In the first part of this work the optimal ratio between carbon powder (RP-20 + graphene) and binder poly(vinylidene fluoride) (PVDF) has been established. In the second part low temperature performance of EDLC based on electrospun half-cell was investigated. Electrochemical measurements were carried out at temperature 24 °C and -30°C. The electrochemical characteristics of EDLC based on electrospun half-cell have been compared with those for EDLC completed using the roll-pressed electrodes.

The optimum carbon and PVDF binder ratio for electrospun electrodes was established for C-PVDF (80-20) system, which demonstrated the high specific capacitance, very small characteristic time constant and very high specific power at the average specific energy (22 Wh kg^{-1}) applied. It was shown that EDLC based on two identical electrospun half-cells demonstrated excellent electrochemical performance even at low temperature (−30 °C) and surprisingly excellent electrochemical stability. It was shown that with the novel electrode preparation method micromesoporous composite electrodes with lower thickness and density can be prepared.

References

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