Program

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(National Tsing Hua University - TW)

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Electrolyte viscosity: limiting parameter of electrochemical capacitor efficiency?

Multiphase composite electrodes for hybrid supercapacitors operated in ionic liquid electrolytes

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The hybrid supercapacitors are a new generation systems that combine the advantages of an electrochemical double-layer capacitor (long cycle life and high power performance) and batteries (high energy density). Despite the increased research interest and intensive work in this area, the achieving a high energy density and power density using an environmentally friendly materials is an up-to-date task that requires further development.

Opportunity in this direction is the use of ionic liquids which, due to their unique properties as solvents over a wide temperature range, are becoming more and more popular in modern green technologies, and the introduction of conductive polymers increase both the electrical conductivity and electrochemical stability of the electrolyte, and the maximum voltage to which can be achieved. On the other hand the development of structured and multiphase composite electrodes with desired morphology and texture based on metal oxides, hydroxides and phosphates will further increase the capacity of the hybrid supercapacitors.

The objective of the present work is to develop an environmental friendly hybrid supercapacitor with composite electrode composed of carbon matrix and nickel-manganese oxides/hydroxides and ionic liquids as electrolytes. The used oxides/hydroxides are synthesized by the precursor method and the individual components and composite materials are characterized by structural, morphological and spectroscopic analysis. The assembled supercapacitor cells are subjected to electrochemical charge/discharge cycling tests and the mechanism of ongoing processes through ex-situ physicochemical analyses is also studied.

The hybrid supercapacitor cells demonstrate improved capacitance performances and are promising for further investigations.

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