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Gel Polymer Electrolytes; Forgotten Part of Energy Storage Devices

Amrita Jain

Institute of Fundamental Technological Research, Polish Academy of Sciences, Pawiñskiego 5B, 02-106 Warsaw, Poland
Email: ajain@ippt.pan.pl

ABSTRACT

The conversion and storage of renewable energy are critical for a sustainable global future. While energy storage devices have evolved, there's an ongoing need for components (electrodes and electrolytes) that offer higher capacity, better safety, a wider electrochemical stability range, and extended lifespans. Given the scarcity of raw materials used in device construction, designing new electrodes and electrolytes from readily available, low-cost materials with simple manufacturing processes is a pressing concern. The aim of this talk will be to present current research related to design and development of novel electrolytes for application in energy storage and conversion system. Particular attention will be paid to new technologies/materials which can be used in energy storage devices particularly focusing on the mechanical stability of the film. The discussion will be illustrated by the achievements of the IPPT PAN team with respect to the defined problems and the solution. Ongoing research carried out in co-operation with academia and industrial partners will also be presented. Now a days with increasing the production and use of renewable energies, its high time to explore a high capacity and low cost energy storage devices. Till now, fossil fuels is the main source of energy but it creates a problem of pollution and global warming. To overcome with these issues, significant efforts have been made to develop renewable energy sources like solar, wind and water tides but to store them batteries, supercapacitors and fuel cells are useful. Out of these devices mentioned, supercapacitors are the energy storage devices with high capacitance, high power density and sufficiently accepted energy density. Depending upon the electrode material used, supercapacitors are classified into two types; pseudocapacitors and electrochemical double layer capacitors (EDLCs). In the present study, an electrochemical double-layer capacitor (EDLC) was fabricated using surface-modified activated carbon materials with metallic nanoparticles (NPs). The surface of the carbon materials were modified by using different NPs in different weight ratios using a low-temperature chemical method. The as-modified materials were used as electrode materials for supercapacitor application. The prepared materials were characterized by using scanning electron microscopy, X-ray diffraction analysis and N_2 adsorption-desorption studies. To fabricate the cell, a magnesium ion- based polymer gel electroyte was used. The cell was characterized by using electrochemical impedance spectroscopy, cyclic voltammetry and charge-discharge techniques. The results of the measurements will be presented at the conference.

Keywords: *Supercapacitors; Activated Carbon; Polymer gel electrolyte; Surface modification.*