Modification of Carbon Network for Enhanced Electrochemical Properties

Amrita Jain[1*], Monika Michalska[2], Pramod K. Singh[3]

[1]*Institute of Fundamental Technological Research, Polish Academy of Sciences, Pawińskiego 5B, 02-106 Warsaw, Poland*

[2]*Department of Chemistry and Physico-Chemical Processes, Faculty of Materials Science and Technology, VŠB-Technical University of Ostrava, 17. listopadu 2172/15, 708 00 Ostrava-Poruba, Czech Republic*

[3]*Department of Physics, Sharda School of Basic Sciences and Research, Sharda University, India*

*Email: *ajain@ippt.pan.pl*

Energy plays a key role for human development, like we use electricity 24h a day and cannot imagine our life without it. There are two types of energy sources namely renewable and non-renewable, till now, fossil fuels is the main source of energy but it creates a problem of pollution and global warming [1]. 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 [2]. 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) [3]. 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 electrolyte 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

References:

1. A. Gaurav, A. Das, A. Paul, A. Jain, B.D. Boruah, M-A. Jalebi, Journal of energy storage 88 (2024) 111468
2. S. Sharma, P. Chand, Results in chemistry 5 (2023) 100885
3. A. Jain, M. Michalska, Materials, Chemistry and Physics 317 (2024) 129200