J Phys Chem Biophys 2017, 7:2(Suppl)
DOI: 10.4172/2161-0398-C1-020

High performance of Li-ion capacitors and internal Li-ion capacitor/Li-ion battery hybrid cells

Jim P Zheng, Annadanesh Shellikeri, Mark Hagon, Junshen Zheng and **Wanjun Cao**
[1]Florida A&M University, USA
[2]Florida State University, USA

We have fabricated pouch cells of Li-ion capacitor (LIC), which is a new energy storage device which consists of an electric double layer capacitance (EDLC) cathode and a Li-ion battery (LIB) anode, between which the ions shuttle during charge and discharge processes. The LIC not only retained all the advantages of EDLC such as specific power >5 kW/kg and cycle life >100,000 cycles; but also had higher specific energy of 15-30 Wh/kg and higher maximum cell voltage of 4.1 V than that of EDLC. The LIC has a wide operating temperature range from -40 to 70°C. Because the potentials of anode and cathode as well as the maximum cell voltage of LIC is comparable to that of LIB, it allows the LIC and LIB to be assembled in one package as a monolithic LIB/LIC hybrid cell. The energy density and power density of the hybrid cell will be designed to meet the requirements by a reasonable distribution of the ratio between LIB and LIC electrodes in a hybrid cell. For example, a LIB/LIC hybrid cell was made with a 20 wt.% $LiFePO_4$ and 80% activated carbon cathode and pre-lithiated hard carbon anode, the specific energy increased by 20% to compare with LIC.

zheng@eng.fsu.edu

Electrical and magneto-electrical characterization of electrochemically synthesized poly(bithiophene) based devices

Jose P M Serbena
UFPR, Brazil

Magnetic dependent properties of organic semiconductors have been observed since the 1960 and 1970 decades. However, since 2003 it has been more extensively studied and characterized, making use, mainly, of electronic device structures, like organic light emitting diodes, to access the intrinsic magnetic sensitive process. Usually, when the observable property of the studied organic device is resistance, the phenomenon is called organic magnetoresistance, and its quantification is made by the relative change of resistance when the sample is submitted to a magnetic field. The magnetoresistance phenomenon on organic semiconductors has been studied mostly on spin-coated or vacuum thermal sublimated materials and only recently on electrochemically synthesized materials. In this work, we report electrical measurements with and without an applied magnetic field on devices constructed in the sandwich structure indium tin oxide (ITO)/poly(bithiophene) (PBT)/aluminum (Al). The PBT polymer was electrochemically deposited on ITO. Optical characterization allowed us to obtain the band gap energy and electrical characterization at room and at low temperatures allowed us to obtain the whole mobility and the trapping states of PBT material and the energy barrier height at the ITO/PBT interface. The observed organic magnetoresistance dependence on direction between current and magnetic field, active layer thickness and temperature were also investigated.

serbena@fisica.ufpr.br