

Highly conducting polymer electrolyte-ionic liquid and porous carbon material for sandwich electric double layer capacitor

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ABSTRACT

Due to various useful properties of polyethers, the prime objective of present paper is to develop an efficient supercapacitor based on high conducting polymer electrolyte and carbon based materials. To develop such films Polyvinylidene fluoride co-hexafluoropropylene (PVDF-HFP) polymer doped with ionic liquid (IL) 1-ethyl-3-methylimidazolium thiocyanate has been prepared using solution cast technique. The detail studies of polymer electrolyte with optimized value of IL: PVDF-HFP i.e. (80:20) we have reported elsewhere. For electrodes, cobalt enriched porous carbon material has been synthesized and characterized in detail. A sandwiched type electric double layer supercapacitor (EDLC) has been fabricated using maximum conducting polymer-IL film which shows ultra-high capacitance of 294 F/g at room environmental condition. This work successfully demonstrates the suitability of polymer electrolyte in developing highly efficient energy devices.

KEYWORDS

Polymer electrolyte; Porous carbon; Super capacitor; Ionic liquid; Cyclic voltammetry

REFERENCES

1. Karakoti, M, Jangra, R, Pandey, S, et al. Binder free reduced graphene oxide as electrode material for efficient supercapacitor with aqueous and polymer electrolytes. *High Perform Polym* 2020; 32: 175–182.
2. Zakariya'u, I, Gultekin, B, Singh, V, et al. Electrochemical double-layer supercapacitor using poly(methyl methacrylate) solid polymer electrolyte. *High Perform Polym* 2020; 32: 201–207.
3. Singh, D, Dhapola, PS, Singh, V, et al. Polyvinylpyrrolidone with ammonium iodide and 1-hexyl-3-methylimidazolium iodide ionic liquid-doped solid polymer electrolyte for efficient dye sensitized solar cell. *High Perform Polym* 2020; 32: 130–134.
4. Ahuja, H, Dhapola, PS, Rahul, et al. Ionic liquid (1-hexyl-3-methylimidazolium iodide)-incorporated biopolymer electrolyte for efficient supercapacitor. *High Perform Polym* 2020; 32: 220–225.
5. Sevilla, M, Mokaya, R. Energy storage applications of activated carbons: supercapacitors and hydrogen storage. *Energy Environ Sci* 2014; 7: 1250–1280.