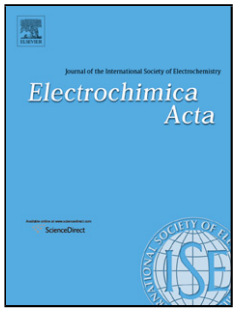

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Author: Chandrasekaran Ramasamy Jesús Palma del Val
Marc Anderson

PII: S0013-4686(14)00949-9
DOI: http://dx.doi.org/doi:10.1016/j.electacta.2014.04.169
Reference: EA 22675

To appear in: *Electrochimica Acta*

Received date: 6-11-2013
Revised date: 27-4-2014
Accepted date: 28-4-2014

Please cite this article as: C.R.; chandruanna@yahoo.com, J.P. Val, M. Anderson, An electrochemical cell study on polyvinylpyrrolidine aqueous gel with glycol addition for capacitor applications, Electrochimica Acta (2014), http://dx.doi.org/10.1016/j.electacta.2014.04.169

An electrochemical cell study on polyvinylpyrrolidine aqueous gel with glycol addition for capacitor applications

Chandrasekaran Ramasamy *, Jesús Palma del Val and Marc Anderson

Electrochemical Process Unit, Instituto IMDEA Energía, 3 Avda. Ramón de la Sagra, Parque Tecnológico de Móstoles, Móstoles E-28935, SPAIN

Abstract

In order to improve a capacitor's energy density, an operative voltage extension is a simplest way. And, an organic gel usage, which has a more stabilized potential window than an aqueous gel. Based on these concepts, we have examined a two electrode symmetric electric double layer capacitor (EDLC) based on YECA activated carbon electrodes at 22ºC using a gel electrolyte from polyvinylpyrrolidine (PVP) in ethylene glycol (EG) – water with sodium sulphate as a salt. Infrared spectroscopy has taken to confirm the electrolyte interactions. Cyclic Voltammetry (CV) results have shown the capacitor's reversibility and symmetric EDL. Linear sweep voltammetry (LSV) was used to determine a 2V applicability of the gel. From the AC impedance (EIS) result, the glycol has increased the cell resistance, but a low percentile of glycol did not show any magnificent changes on the aqueous gel based cell. Galvanostatic cycling (CD) test also performed which evidences an improvement in the low rate aqueous gel based cell and its voltage limit. A typical specific capacitance, real power and energy density of the cell with 10% replacement of water by glycol were ~21 $F.g^{-1}$, 0.7 $kW.kg^{-1}$ and 11 $Wh.kg^{-1}$ of respectively which is significantly higher than the aqua gel based cell (~22 $F.g^{-1}$, 0.55 $kW.kg^{-1}$ and 6 $Wh.kg^{-1}$).

Keywords: supercapacitor, sodium salt, aqueous polyvinylpyrrolidine gel, activated carbon, ethylene glycol,

*present

ramachandru70@hotmail.com or chandruanna@yahoo.com