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Influence of the electrolyte window potential on the electrical characteristics of supercapacitors operating elevated temperatures

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The equivalent series and parallel resistances (EPR and ESR) and specific capacitance (Cs) of supercapacitors carbon electrodes have been investigated using cyclic voltammetry and electrochemical impedance spectroscopy. Commercial activated carbon electrodes employing organic electrolyte have been tested using a window potential in the range of 2.7–3.8 V. Specific capacitances were calculated from cyclic voltammetry curves at room temperature employing various scan rates (2-50 mVs-1). Internal series resistances of the supercapacitors were measured using the galvanostatic curves at room temperature and above (25-100oC). The ESR increase to 9.75 ? at 25° and 2.7V for 110.5 ? at with operating temperature raise and also with overpotential. The parallel series resistance (EPR) have also been determined using self-discharge curves at 3, 24, 48 and 120h in three distinct temperatures (25-100oC). The EPR modify with increase of temperature and also with overpotential staring 0.623 M? at 25°C and 2.7 V for 0.089 M? at 100°C and 3.8V. The microstructures of the electrode material have been investigated using scanning electron microscopy (SEM) and chemical microanalyses employing energy dispersive X-ray analysis (EDX). A compositional and morphological evaluation of these electrodes showed a very homogeneous structure. It has been shown that the specific capacitance decreased considerably with scan rate, current density, electrochemical window potential and working temperature.