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Characteristics of electrostatic double layer capacitors prepared with electrolytes based on potassium hydroxide and glycerin

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Electrical double layer capacitors (EDLC) or electrochemical supercapacitors store significantly larger amounts of energy than the conventional dielectric capacitor. The aim of this work was to study the storage capacity characteristics of electrical double layer capacitors operating at room temperature with electrolytes based on glycerin and potassium hydroxide (KOH). Standard aqueous KOH electrolyte has also been prepared and used as a comparison. The EDLC were prepared using commercial activated carbon electrodes and the removal of the toxic organic electrolyte was carried out using back pumping vacuum (10-1 mbar). The electrical properties were investigated in a computerized electronic analyzer (Arbin BT-4 Analyzer). Tests for galvanostatic cycles and cyclic voltammetry were carried out to evaluate the influence of the electrolyte on storage capacity and internal equivalent series resistance (ESR). Voltammetry scan rates were varied from 1 to 30 mV.s-1. The lowest scan rate led to the highest specific capacitance of about 120 F.g-1 at room temperature and a maximum applied potential of 4.1 V. At room temperature, the standard KOH aqueous electrolyte yielded a specific capacitance of only 60 F.g-1 with an applied potential of 1.1 V. Internal equivalent series resistance determined by the galvanostatic cycle with a current density of 20 mA.g-1 resulted in ESR about 1.0 ?. cm^2. Characterization of the activated carbon electrodes were carried out by scanning electron microscopy (SEM).