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ELECTROCHEMICAL CHARACTERISTICS OF TITANIUM CARBIDE DERIVED CARBON|1-ETHYL-3-METHYLIMIDAZOLIUM TETRAFLUOROBORATE ELECTRICAL DOUBLE LAYER CAPACITORS

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A modern technological society demands the use and storage of energy on a major scale, employing large and small scale systems for that purpose. High power density and cyclability makes supercapacitors (SCs), desirable energy storage devices in many technological fields [1]. The electrolyte and electrode material properties used in SCs determine the performance characteristics of a supercapacitor. For that reason, the study and modeling of the microporous carbon electrode (MPCE)|electrolyte (including room-temperature ionic liquid) interface in SCs is essential for development of systems with high energy [2].

In our work, suitability of 1-ethyl-3-methylimidazolium tetrafluoroborate ($EMImBF_4$) as electrolyte for SCs was studied. Two electrode systems researched were completed using 2 cm^2 TiC derived microporous carbon material, C(TiC), for electrodes and cellulose membrane TF4425 (thickness 25 μm) from Nippon Kodoshi as a separator.

Electrode systems were assembled inside glovebox and therefore filled with $EMImBF_4$, and sealed hermetically for cyclic voltammetry, constant current charge/discharge and electrochemical impedance measurements at temperatures (*T*) 25, 43, 59, 80, 87 and 100°C. Also, conductivity and viscosity of $EMImBF_4$ were measured on temperatures mentioned.

The electrochemical behavior of C(TiC)|$EMImBF_4$ supercapacitor has been described in the terms of region of ideal polarisability, gravimetric series capacitance, series resistance, characteristic time constants, specific energy density, and specific power density at different temperatures. Dependence of named characteristics on the test cell voltage and temperature applied have been brought out and explained.

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References:

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