ENHANCED POWER PERFORMANCE OF HIGHLY MESOPOROUS SOL GEL TiC DERIVED CARBONS IN IONIC LIQUID AND NON-AQUEOUS ELECTROLYTE BASED CAPACITORS

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The electrical double layer capacitors (EDLC) were tested. For electrode material micro-mesoporous sol-gel TiC derived carbon (SgTiC-CDC) was used and for electrolytes 1-ethyl-3-methylimidazolium tetrafluoroborate ($EtMeImBF_4$) and 1M Et_3MeNBF_4 + acetonitrile (AN) was used. The precursors for the micro-mesoporous carbon electrodes were synthesized via modified sol-gel synthesis process. The sol-gel TiC derived hierarchical carbon materials exhibit larger specific density functional theory surface areas (up to 1700 m^2 g^{-1}) and a unique pore size distribution (mesopores between 2 and 10 nm) compared to traditional TiC derived carbons that are commercially available. The electrochemical properties of the EDLCs were investigated using cyclic voltammetry, electrochemical impedance spectroscopy, galvanostatic charge/discharge and constant power discharge methods. The EDLCs demonstrated nearly ideal capacitive behavior even at very high charging/discharging currents (10 A g^{-1}) and cell potential scan rates (500 mV s^{-1}). The EDLCs completed from SgTiC-CDC materials and $EtMeImBF_4$ and Et_3MeNBF_4 + AN show good energy efficiency (varying from 93% to 95% at current 1 A g^{-1}) and coulombic efficiency values exceeded 99% [1].

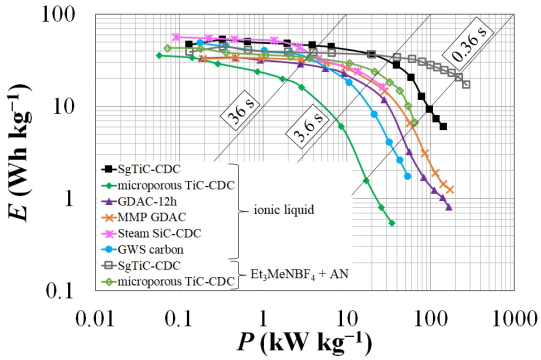

Fig. 1 *Gravimetric Ragone plots for different carbon materials*

References

1. M.Paalo, I.Tallo, T.Thomberg, A.Jänes, E.Lust, 2019, *J. Electrochem. Soc.*, 166 (13), A2887-A2895.

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