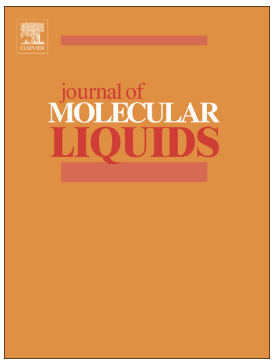

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Acetate- and lactate-based ionic liquids: synthesis, characterisation and electrochemical properties

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Abstract

Several acetate and lactate ionic liquids (ILs) based on pyrrolidinium, piperidinium, or piperazinium cation were synthesised and characterised. Two of these compounds, *N*-methyl-*N*-propylpyrrolidinium acetate ([MPPyrr][Ac]) and *N*-methyl-*N*-propylpyrrolidinium lactate ([MPPyrr][L]) have been proved to be room temperature ionic liquids (RTILs). Temperature dependencies of conductivity and electrochemical stability of RTILs were determined. The conductivities of these compounds were of the order of ca. 6 mS cm^{-1} at ambient temperature. The Vogel-Tammann-Fulcher (VTF) equation was used to describe the dependence of conductivity on temperature with high precision. Electrochemical stability ranges were estimated on platinum and a glass-like carbon electrode. Electrochemical properties of all synthesized ILs in a form of mixtures with acetonitrile (AN) were also determined. Acetonitrile concentration dependencies of conductivity as well as the electrochemical stability of IL/AN mixtures were measured. Additionally, neat RTILs, as well as IL/AN mixtures, were tested as electrolytes in EDLC devices with commercial carbon cloth as the electrode material. The specific capacitances of these devices shown values of 34-57 F g^{-1}, with 2 V of maximum operating voltage. The addition of AN increases conductivity significantly and distinctly improves the electrochemical properties of the capacitor cells by changing wettability and the charge relocation speed of the electrolytes in the selected electrode material.

Keywords: pyrrolidinium; piperidinium; piperazinium; lactate; acetate; ionic liquids