Jakub Tomasz

Poznan University of Technology, Poland

The Application of Choline Salts Based Electrolytes in Electrochemical Capacitors

Abstract:

Choline salts, most commonly occurring as choline chloride, have recently attracted considerable scientific interest due to their unique structural and electrochemical features. Their high ionic conductivity and ability to decrease the crystallization temperature of electrolyte systems make them highly promising candidates for use in advanced energy storage devices. Furthermore, their low toxicity and biodegradability allow them to be classified as environmentally friendly materials, which is an additional advantage in the search for sustainable electrolyte solutions. In this study, a series of novel salts containing choline cation combined with various carboxylic anions, including tartaric, maleic, citric, and others, were synthesized. Their physicochemical properties were systematically examined, with a particular focus on solubility in selected organic solvents such as acetone, ethanol, dimethyl sulfoxide, ethylene glycol and isopropanol. The resulting solutions, with solvents capable to dissolve selected salts, were further subjected to preliminary electrochemical characterization, among others temperature-dependent ionic conductivity measurements. Based on these results, electrolytes displaying the most favourable conductivity were identified and subsequently applied in the assembly of electrochemical capacitors. The obtained results of electrochemical investigation highlight the significant potential of application of choline-based electrolytes in supercapacitors, demonstrating their capability for further optimization and possible application in next-generation electrochemical energy storage systems. The study has been financed by the Minister of Science and Higher Education, Republic of Poland, under the Programme “Studenckie koła naukowe tworzą innowacje”

Biography

Jakub Tomasz is a master's student in chemical technology at Poznań University of Technology, specialising in applied electrochemistry. He is an active member of the "Poli-MERitum" student's scientific grup, focusing on polymer materials, their synthesis, applications, and advanced characterisation. As one of the project leaders, he contributes to the research initiative "Studenckie koła naukowe tworzą innowacje," funded by the Polish Ministry of Science and Higher Education. His engineering thesis concerns the synthesis of electrode materials based on metal sulphides and their application in sodium-ion cells. As a young researcher, he has had the opportunity to present the findings of his work at scientific conferences.