Full Paper

Comprehensive insights into the thermal stability, biodegradability and combustion chemistry of Pyrrolidinium-based Ionic Liquids

Gebrekidan GebreSellassie Eshetu, Sangsik Jeong, Pascal Pandard, Amandine Lecocq, Guy Marlair, Stefano Passerini

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Abstract

The use of ionic liquids (ILs) as advanced electrolytes components in electrochemical energy storage devices is one of the most appealing and emerging options. However, though ILs are hailed as safer and eco-friendly electrolytes, overcoming the limitations imposed by the highly volatile/combustible carbonate based electrolytes, the full scale and precise appraisal of their overall safety levels under abuse conditions still need to be fully addressed. With the aim of providing the treated level of information on the thermal and chemical stabilities as well as actual fire hazards, we embarked on a detailed investigation of the short - and long - term thermal stabilities, bio-degradability and combustion behaviour of various pyrrolidinium ([Pyr1A]+)-based ILs, enlisting different alkyl chain lengths, [Pyr1A]+ (A=3-10), counter-anions ([TFSI]-/[FSI]-/[BETI]-), cations (Pyr14+/Pyr12O1+) and the effect of doping with Li salts (e.g. Li[TFSI]/[Pyr14][TFSI]).