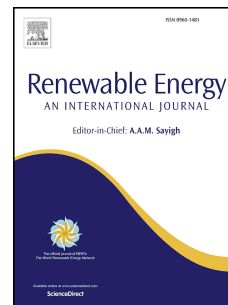


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Preparation and kinetics study of biodiesel production from waste cooking oil using new functionalized ionic liquids as catalysts

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Abstract

In this work, 1,4-sultone and benzimidazolium-based ionic liquids (ILs) with four different anions were synthesized, and their structures were confirmed by nuclear magnetic resonance (NMR) and elemental analysis (CHNS). The acidity of the synthesized ILs was studied using Hammett acidity function and COSMO-RS. The waste cooking oil was used as a raw material for biodiesel production and their different fatty acids were determined by gas chromatography coupled with flame ionization detector (GC-FID). These four ILs, as catalysts, were screened and comparatively IL 3-methyl-1-(4-sulfo-butyl)-benzimidazolium trifluoromethanesulfonate [BSMBIM][CF₃SO₃] was selected for further detailed optimization study. This IL experimental efficiency results supported the Hammett acidity function and COSMO-RS study. The catalyst performance was studied and optimised the different parameters. The catalyst efficiency was studied in one and two-step reactions. [BSMBIM][CF₃SO₃] as a catalyst showed the esterification of waste cooking oil up to 78.13% in a single step reaction. Potassium hydroxide was used in the second step to transesterify the waste cooking oil up to 94.52%. The catalyst was reused for seven times with high-yield production. The obtained biodiesel was characterised by GC, NMR, FTIR,

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