

Esterification of hexanoic acid to hexyl hexanoate with heterogeneous Amberlyst resins: Optimization study on model compounds and grape pomace-derived fermentation crudes

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Esters are attracting great industrial interest, being exploitable for different applications (solvents, flavours, lubricants, plasticisers, biofuels, etc.) [1]. Esterification is an equilibrium reaction, needing of appropriate Brønsted acidity to overcome catalytic issues. Moreover, an excess of the alcohol is generally employed (typically, alcohol/carboxylic acid molar ratio higher than 4), and the removal of the produced water is sometimes carried out to maximize its production. In this context, hexyl hexanoate (HexHex) is industrially attractive as fragrance, lubricant, but also as oxygenated additive for diesel fuels [1]. As for other esters, mineral acids have been traditionally used to catalyse HexHex synthesis, but these show relevant environmental and work-up issues [2]. In this work, commercial sulfonic resins (Amberlyst) were employed for the HexHex synthesis, which was univariately optimized. Focusing on the most effective resin (Amberlyst-35), according to Figure 1, the catalyst loading was minimized, keeping a low alcohol/carboxylic acid molar ratio of 2, which is an effective choice for simplifying the next work-up. The in-situ use of a drying agent was also considered, to maximize the HexHex production. These optimized reaction conditions have been applied to the conversion of hexanoic acid-rich real feedstock, obtained by a novel biotechnological process of acidogenic fermentation of grape pomace, confirming the excellent results from the model compounds.

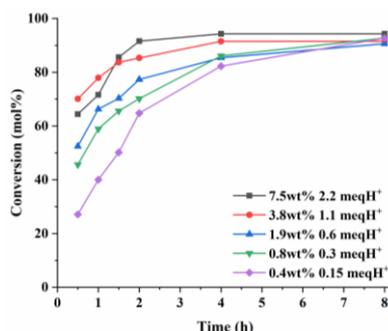


Figure 1. Kinetics of the HexHex synthesis at 120 °C, employing a constant alcohol/carboxylic acid molar ratio of 2, and different loadings of Amberlyst-35.

References:

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