Title Process optimisation for the production of biodiesel from rapeseed soapstock by a novel method of short path distillation

Author Ping Shao, Jinze He, Peilong Sun and Shaotong Jiang

Citation Biosystems Engineering, Volume 102, Issue 3, March 2009, Pages 285-290

Keywords rape seed; biodiesel

Abstract

Refined vegetable oils are the predominant feedstocks for the production of biodiesel. However, their relatively high production costs make it difficult for the resulting fuels to compete with petroleum-derived fuels. An effective method involving a short path distillation pretreatment followed by appropriate esterification and transesterification was proposed. A short path distillation process was developed to separate free fatty acids (FFAs) and esterified fatty acids from rapeseed soapstock (SS). Response surface methodology (RSM) analysis was carried out on the process of FFA esterification catalysed by an acid catalyst (sulphuric acid) to prepare biodiesel from rapeseed SS using methanol. Methanol substrate, acid concentration and reaction time were the three important parameters investigated. RSM analysis showed close agreement between experimental and predicted values. It was found that the most effective parameter was methanol quantity, which was in agreement with the results. The coefficient of determination (R^2) for the model was 99.80%. A probability value ($P < 0.0001$) demonstrated a very high significance for the regression model. A biodiesel yield of 96.45% was obtained when optimum conditions of catalysed biodiesel production were used. Optimum performance occurred with a methanol to oil ratio of 0.33 v/v, an acid catalyst of 1.44% v/v and a reaction time 1.42 h at 60 °C. Transesterification with glycerides was also carried out with a methanol to oil molar ratio of 6.3:1 and a KOH catalyst 1.0% w/v to produce biodiesel of 98% purity.