

Optimization of biodiesel production from waste cooking oil using ion exchange resins

Abstract:

Waste cooking oil is a potential alternative of refined vegetable oil for biodiesel production due to its low cost and elimination of its disposal problem. The concentration of free fatty acids (FFAs) in WCO dictates the type of chemical treatment required for biodiesel production: a single esterification reaction is considered at high content of FFAs, whereas, a combination of esterification and transesterification reaction is used at moderate content of FFAs. In this study, optimization of esterification process of FFAs in artificially acidified soybean oil with oleic acid combined with methanol as an agent and ion exchange resin as a heterogeneous catalyst was carried out. The optimization process was performed by means of Matlab software based on a kinetic model available in the literature. Conversion of acidified oil was determined as an objective function in correlation with reaction variables i.e., temperature and catalyst weight. It is found that the maximum conversion of the free acids is 95.95% which is achievable at 4.48 g catalyst loading and reaction temperature of 120°C.