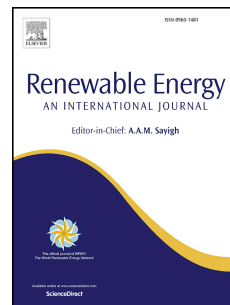


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# Optimization of continuous esterification of oleic acid with ethanol over niobic acid

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**ABSTRACT:** The aim of this work was to evaluate the continuous production of biodiesel through the esterification reaction between oleic acid and ethanol using niobic acid as a solid acid catalyst. In this study, different calcination temperatures of niobic acid were tested. W/F tests were carried out, to avoid mass transfer problems and, then, the catalytic activities of all the samples were evaluated. Results showed that niobic acid calcined at 350 °C presented the highest catalytic activity. The experimental conditions of temperature, amount of catalyst and ethanol:oleic acid molar ratio were optimized by using design of experiments (DOE) and canonical analysis. All three single parameters were significant on the yield of esters. The esterification reaction of oleic acid led to yields of esters up to 70% and conversion up to 90%, at 249 °C, ethanol:oleic acid molar ratio of 10.83:1 and 0.7 g of niobic acid.

**Keywords:** continuous esterification, oleic acid, niobium, niobic acid, design of experiments, canonical analysis.

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