

# Intensified two-step alkaline and acidic process yielding high purity glycerin and biodiesel

Frederico Augusto Araujo<sup>1</sup>, Mohand Benachour<sup>2</sup>, and Cesar de Abreu<sup>1</sup>

<sup>1</sup>UFPE

<sup>2</sup>Affiliation not available

October 12, 2022

## Abstract

Cottonseed oil was hydrolyzed producing glycerin and fatty acids, which were processed in the presence of sulfuric acid diluted with methanol or ethanol producing the corresponding fatty esters. High purities of the ester mixture were achieved by proceeding during processing to remove the water by hydration with Na<sub>2</sub>SO<sub>4</sub> and by simultaneously distilling the residual alcohol. Esterifications carried out at 60°C with methanol and at 75°C with ethanol showed that after 90 min of reaction, conversions of the fatty acid mixture of approximately 98% were obtained, which produced methyl and ethyl biodiesel with 96% and 98% purity, respectively. A model based on the acid esterification mechanism and representing the evolution of fatty ester concentrations was adjusted to the experimental results with quantification of the orders of magnitude of the kinetic parameters. Esterifications with both alcohols occurred at specific reaction rates up to  $6.54 \times 10^{-1} \text{ s}^{-1}$ . Simultaneously, separations were carried out by distillation of alcohol and removal of water at rates of the order of  $10^{-6} \text{ s}^{-1}$ . The process was intensified with both alcohols, occurring mainly due to the simultaneous distillation of the alcohol and the removal of water from the medium.

## Hosted file

C:\selectlanguage{ngerman}ópia de ART Biodies Intens. 21.docx available at <https://authorea.com/users/514311/articles/590159-intensified-two-step-alkaline-and-acidic-process-yielding-high-purity-glycerin-and-biodiesel>