

# Production of Biodiesel by Zeolite BEA Catalyzed Transesterification of Triglycerides in Excess Methanol

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Biodiesel, a mixtures of long-chain fatty acid alkyl esters (FAAEs), is generally synthesized from catalyzed transesterification of triglycerides, e.g. vegetable oils and animal fats, with short chain alcohols. The common catalysts in transesterification are homogeneous catalysts such as sodium hydroxide and potassium hydroxide. However, the homogeneous catalyst has led to some technical problems, for example, great difficulty in removal of these catalysts and massive amount of produced water from biodiesel products owing to saponification. Extra expenses have to be spent in after-reaction purification of biodiesel in such homogenous catalytic reaction systems. Alternatively, heterogeneous catalysts were introduced to avoid these drawbacks. Therefore, transesterification by using heterogeneous catalysts to produced biodiesel in environmentally friendly processes has drawn more and more research attention.

In this study, zeolite BEA prepared in house was chosen as model heterogeneous catalysts in catalyzed transesterification of triolein in excess methanol. The zeolite BEA was hydrothermally synthesized from  $\text{Na}_2\text{O}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ , and TEAOH in water. The crystallinity of the obtained zeolite BEA could be associated with crystallization time and temperature. Before transesterification, *as*-obtained zeolite BEA was modified by alkali ion exchange method to render better catalysis. Effects of sources and types of alkali ions, such as  $\text{Na}^+$ ,  $\text{Li}^+$ ,  $\text{K}^+$ , and  $\text{Ca}^+$ , and the loadings of these alkali on the conversion efficiency of triolein to biodiesel will be presented and discussed. Additionally, crystallinity of zeolite BEA, and process parameters on the conversion efficiency of transesterification reaction are will be discussed as well.

Keywords: Transesterification; Biodiesel; Zeolite Beta; Triolein; Ion exchange.

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