

## Two Step Biodiesel Production from High Free Fatty Acid Spent Bleaching Earth

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**Abstract :** Biodiesel may be economical if produced from inexpensive feedstock which commonly contains high level of free fatty acids (FFA) as an inhibitor in production of methyl ester. In this study, a two-step process for biodiesel production from high FFA spent bleach earth oil in a batch reactor is developed. Oil sample extracted from spent bleaching earth (SBE) was utilized for biodiesel process. In the first step, FFA of the SBE oil was reduced to 1.91% through sulfuric acid catalyzed esterification. In the second step, the product prepared from the first esterification process was carried out transesterification with an alkaline catalyst. The influence of four variables on conversion efficiency to methyl ester, i.e., methanol/ SBE oil molar ratio, catalyst amount, reaction temperature and reaction time, was studied in the second stage. The optimum process variables in the transesterification were methanol/oil molar ratio 6:1, heterogeneous catalyst conc. 5 wt %, reaction temperature 65 °C and reaction time 60 minutes to produce biodiesel. Major fuel properties of SBE biodiesel were measured to comply with ASTM and EN standards. Therefore, an optimized process for production of biodiesel from a low-cost high FFA source was accomplished.

**Keywords :** biodiesel, esterification, free fatty acids, residual oil, spent bleaching earth, transesterification

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