

## **Synthesis of carbide lime waste derived base catalyst (KF/CLW-Fe<sub>3</sub>O<sub>4</sub>) for methyl ester production: An optimization study**

### **ABSTRACT**

In this paper, solid base catalyst KF/CLW-Fe<sub>3</sub>O<sub>4</sub> was prepared from carbide lime waste, primarily calcium hydroxide with tiny amounts of carbonate and; the catalyst was used in the optimization study on the methyl ester production. The new strong base catalyst was synthesized by chemical impregnation. This catalyst was characterized by Hammett indicator analysis, Brunauer-Emmett-Teller (BET), scanning electron microscope (SEM), X-ray diffraction (XRD), and temperature-programmed desorption (TPD) of carbon dioxide. The catalyst was further used to catalyze the transesterification reaction to produce methyl ester. Taguchi method was used to assess the impact of catalyst at different intervals of reaction parameters, including reaction time, methanol to oil ratio, and catalyst loading. A mixed level of orthogonal array design with L<sub>9</sub>, analysis of variance (ANOVA) and signal to noise ratio were used to determine parameters that significantly impact the palm oil transesterification reaction. High methyl ester conversion was attained, and the catalyst can be easily separated and reused. KF/CLW-Fe<sub>3</sub>O<sub>4</sub> has great potential to be used to produce methyl ester because of its high catalytic activity and environmental friendliness.