

## **K<sub>2</sub>O doped dolomite as heterogeneous catalyst for fatty acid methyl ester production from palm oil**

### **ABSTRACT**

Biodiesel obtained from palm oil over an environmentally friendly catalyst is highly desirable. For that matter, dolomite, a natural material was used as a catalyst in this work, and this included potassium oxide (K<sub>2</sub>O)-doped dolomite, 5 wt% K/D, 10 wt% K/D, 15 wt% K/D, and 20 wt% K/D. X-ray diffraction analysis of dolomite revealed the CaO and MgO phases with high crystallinity, in which intensity reduced after doped with varying concentrations of K<sub>2</sub>O. When the catalysts were evaluated, the K<sub>2</sub>O-doped dolomite exhibited a better catalytic activity for palm oil transesterification. In the presence of K<sub>2</sub>O, the methyl ester reached 98.7%, with the highest being displayed by 15 wt% K/D as compared to 87% over dolomite at reaction temperature of 60 °C, 12:1 methanol to palm oil ratio, 1 wt% catalyst amount and 1 h reaction time. SEM revealed that as more K<sub>2</sub>O was doped on dolomite, the particles became more agglomerated, with a reduced BET surface area of 1.3 m<sup>2</sup>/g in 20 wt% K/D as opposed to homogeneously small-sized MgO and CaO particles in dolomite with a high BET surface area of 19.0 m<sup>2</sup>/g. However, the high activity of the doped catalyst was dictated by the high amount of basic site, as evidenced in TPD-CO<sub>2</sub> which showed an increase in the capacity of the basic site with an increased amount of K<sub>2</sub>O. The catalyst was also reusable up to six times with a negligible decrease in activity due to K<sup>+</sup> leaching.

**Keyword:** Dolomite; K<sub>2</sub>O/dolomite; Biodiesel; Transesterification; Palm oil