

**SYNTHESIS AND CATALYTIC PERFORMANCE OF  
MIXED OXIDES (Cr-Mn-Ti) CATALYSTS IN  
TRANSESTERIFICATION OF WASTE COOKING  
PALM OIL TO FATTY ACID METHYL  
ESTER(FAME)**

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## **AUTHOR'S DECLARATION**

I declare that the work in the thesis was carried out accordance with the regulation of Universiti Teknologi MARA. It is original and is the result of my own, unless otherwise or acknowledge as reference work.

I, hereby acknowledge that I have been supplied with the Academic Rules and Regulation, Universiti Teknologi MARA, regulating the conduct of my study and research.

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## ABSTRACT

Biodiesel as fatty acid methyl ester (FAME) derived from vegetable oils has considerable advantages in terms of environmental protection. It has been introduced as an alternative source of fuel and diesel in response to increasing concerns over global warming and carbon emission. Heterogenous mixed oxide catalyst were used for the transesterification of waste cooking palm oil (WCO) as feedstock with methanol to produce biodiesel fuel. This research project was carried out to investigated the transesterification of waste cooking palm oil to produce biodiesel using mixed oxides catalyst which are CrO<sub>2</sub>-MnO<sub>2</sub>-TiO<sub>2</sub>, as a heterogenous catalyst. The effect of metal ratio (Cr,Mn,Ti) and calcination temperature for synthesis of catalyst were investigated. The reaction were conduct in batch reactor with the temperature 160°C. The result shown that the best catalysts ratio (Cr:Mn:Ti) was obtained at 1:1:2 and the optimum calcination temperature is at 600°C during reaction time is 2 hours. For effect metal ratio, the highest FAME yield was obtained with the lowest density which is 725 kg/m<sup>3</sup>, while at optimum calcination temperature the density is about 622 kg/m<sup>3</sup>. Overall, this research show that the effect of two parameter for mixed oxide catalyst (Cr, Mn, Ti) give a good potential in large scale biodiesel production from waste cooking oil..