

# *7th International Conference on Science and Development of Nanotechnology*



## **Effect of blending diesel fuel with produced biodiesel using a nanocatalyst on the combustion behavior and emission profile of a diesel engine**

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### **Abstract**

In the present study, the biodiesel was produced from waste cooking oil using heterogeneous catalyst. Microwave-assisted solution combustion method was utilized for fabrication of  $\text{Ca}_{12}\text{Al}_{14}\text{O}_{33}$  as support and KOH as active phase was impregnated. The nanocatalyst presented that the crystallinity, crystalline size and surface area the final nanocatalysts are well for a catalyst for using in chemical reaction. Then, It was blended with net diesel fuel at volume ratios of 10:90 (B10), 25:75 (B25), and 40:60 (B40) for using in the injection system of a 6-cylinder diesel engine operated at a constant speed of 1500 rpm to compare changes in the combustion (engine performance) and exhaust emissions of engine. The results showed that blending net diesel fuel with biodiesels slightly improved the engine performance and combustion behavior. Increasing in the power from 20.4 kW for net diesel fuel to 24.24 kW for B25 at the engine load of 75% was detected. Moreover, decreasing in the BSFC was detected that B25 present main reduction. The exhaust gas emissions were also showed an appropriate decrease in carbon monoxide, and increasing in the  $\text{CO}_2$  emissions which are related to improving the fuel combustion by blending with biodiesel. According to the results, blending the net diesel fuel with 25 vol.% of biodiesel and operating the diesel engine at 50% of fuel load could lead to an appropriate engine performance along with a considerably reduction in the exhaust gas emissions.

**Keywords:** Waste cooking oil (WCO), Heterogeneous catalyst, Biodiesel, Engine Performance, Exhaust emissions.