

# Physio-geometrical Characterization of Combustion Generated Nano-particle Emissions from a Palm Oil Based Biodiesel Fueled Agricultural Engine

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## Abstract

A physio-geometry of the particulate matter emitted from the combustion chamber becomes growingly important as it can affect to the exhaust gas after-treatment devices. The surface area of the particles will play a vital role as it is a site for catalytic combustion to be taken place. This work investigates the combustion characteristics and particulate matter related emissions of a single-cylinder agricultural diesel engine fueled with palm oil based biodiesel at constant speed and loads. The experimental results from the combustion analysis using an indicating system reveal that the biodiesel initiates the combustion faster with pronounce premixed combustion regime than that of diesel fuel. The specific fuel consumption of biodiesel was greater that leads to a slight reduction in brake thermal efficiency compared with diesel. Biodiesel combustion reduces smoke opacity that is ultimately in-line with the total particle mass. The nano-particle emissions was characterized by an electrical mobility spectrometer and analyzed in terms of number, surface area, and mass. The particle number size distribution was found to be in the nucleation and accumulation modes, and the total particle number increased with smaller size when fueling with biodiesel. The distributions of the particle surface area and mass are left-screwed in the log-scale of area and mass diameter ranges, respectively, leading to the lesser total particle areas and masses for biodiesel fuel at smaller size.

**Keywords :** Biodiesel, Combustion, Diesel, Distribution, Emission, Engine, Particulate matter

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