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The potential of waste cooking oil-based biodiesel using heterogeneous catalyst derived from various calcined eggshells coupled with an emulsification technique: A review on the emission reduction and engine performance

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ABSTRACT

Nowadays, biodiesel is an alternative fuel to replace the existing petroleum-based diesel. The advantages of biodiesel are good combustion efficiency, high-lubricity, biodegradability and low toxicity. Biodiesel can be an alternate fuel to be used for running diesel engines. This paper is to present a comprehensive review on the past efforts to enhance and commercially improve the transesterification by using homogeneous base catalyst, e.g. sodium hydroxide or potassium hydroxide. By introducing heterogeneous base catalyst such as calcium oxide which was made from waste material such as chicken eggshell, quail eggshell and ostrich eggshell it may cater the excessive washing problem to remove the excessive reactants and glycerol. It is also an environment friendly way of recycling the waste eggshells; nevertheless, the NO_x emission remains high – around 5–10% more than conventional diesel fuel. Thus, subsequently, this paper also discusses emulsification of biodiesel with water to investigate its influence on the overall diesel engine performance which includes a comparison study of gas emission from pure biodiesel, diesel and emulsion of biodiesel and water. Compared with conventional biodiesel, some of the notable advantages from this water emulsified biodiesel are the emission reduction of NO_x, particulate matter, unburned hydrocarbon and carbon monoxide.

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Contents

1. Introduction	590
2. Biodiesel production	590
2.1. Biodiesel production method	591
2.2. Catalyst selection in transesterification	592
2.3. Properties of waste chicken and quail eggshells for heterogeneous base catalyst, CaO	594
2.4. Other potential heterogeneous base catalyst, CaO from ostrich eggshell	594
2.4.1. Biodiesel characterization: yield of biodiesel from heterogeneous catalyst, eggshell	594
3. Biodiesel–H ₂ O emulsion	595
3.1. A brief to biodiesel–H ₂ O emulsion	595
3.2. Two-phase emulsion, water-in-oil	596
3.3. Three-phase emulsion, oil-in-water-in-oil	596
3.4. Surfactant selection	597
3.5. Diesel engine or generator types	597
3.5.1. Types of diesel engine	597

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