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Experimental investigation of CI engine fueled with renewable heterogeneous catalyst-based biodiesel

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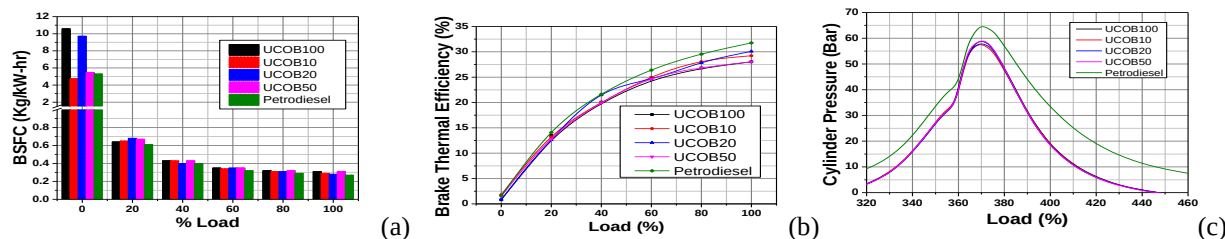
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Introduction: Biodiesel generally shows 1.5 times higher viscosity than petroleum diesel and this results in failure during long term operations of CI engine (1). In this analysis, used cooking oil (UCO)-based biodiesel was produced with the help of renewable heterogeneous catalyst in a high-pressure high temperature reactor for high viscosity reduction and tested it on a single cylinder four stroke CI engine. Musa balbisiana Colla underground stem (MBCUS) ash was used as a renewable heterogeneous catalyst.

Methods: Biodiesel was prepared in a 2 L capacity, high-pressure high temperature (HPHT) reactor with 5 wt% of MBCUS at temp 275°C, under pressure (H₂) of: 1 MPa and oil to methanol molar ratio was 1:9.

Results & Discussions: Fig. 1(a) illustrates that the brake specific fuel consumption (BSFC) for UCOB20 was almost comparable with petrodiesel. This was due to the oxygenated nature UCOB20 which tends to higher combustion efficiency even after 20% replacement from petrodiesel (2,3). Fig 1(b) depicts that the brake thermal efficiency (BTE) of UCOB20 was slightly lower than petrodiesel. This may be due to lower GCV of UCOB20 in comparison with petrodiesel, which results lower cylinder pressure at same fuel doses (4). Fig. 1(c) depicts that the maximum cylinder pressure for UCOB10, UCOB20, UCOB50, UCOB100 and petrodiesel was 57.50 bar @370° crank angle (CA), 59.49 bar @370° CA, 58.60 371° CA, 58.88 bar @ 371CA, 65.43 bar @371° CA, respectively.



Conclusions: BTE and BSFC of UCOB20 were almost comparable with petrodiesel. Combustion delay was short for UCOB20, also the combustion characteristics reflects superior combustion.

Keywords: Heterogeneous catalyst; Combustion analysis; Biodiesel; CI engine; Used cooking oil

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