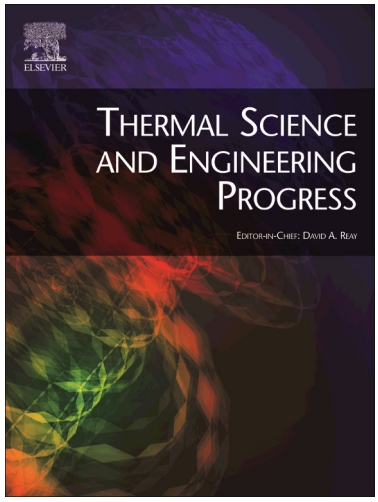

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ABSTRACT

Fire experiments with jatropha oil are performed in a cubical compartment of volume 64 m^3 to explore fire development and induced thermal environment. A door opening of size 2 m height and 1 m width is made on the front wall for ventilation purpose. Three fire experiments, with full door, half door and quarter door ventilation conditions, are conducted. Heat release rate (HRR), mass loss rate (MLR), profiles of flame temperature, room corner temperature, door temperature with velocity profiles and heat flux at different locations have been recorded. It is found that reducing the door ventilation from full door to quarter door results in change in average mass loss rate from 8.42 g/s to 6.82 g/s and fire remains overventilated type. Experiment performed under full door and half door ventilation are then simulated using CFD code, Fire Dynamics Simulator (FDS, version 6.2.0). Based on the simulations results of full door, half door ventilation recommended mesh size is 0.05 m to 0.07 m and corresponding value of $D^*/_{dx}$ is in the range of 8.34 to 12.

Keywords: Compartment fire, Jatropha oil pool fire, CFD modeling, heat release rate.

1. Introduction

Depletion of petroleum derived fuels has encouraged to use environmental friendly green energy sources. In alternative fuel, biofuels are top priority because of the easily available feed stocks. India, due to its tropical climatic conditions and vast degraded forests and non forests land makes it feasible for cultivation of tree such as Jatropha curcas; giving non edible oil seeds for biodiesel production. With the widespread use of Jatropha oil, it is necessary to consider the safety aspects regarding its handling and storage. Fire resulting from accidental spill can cause casualties and damage to surrounding buildings due to thermal radiation and toxic gases. So, knowledge of burning behavior of crude Jatropha oil is necessary to safely handle these fuels.

There have been a number of studies on burning characteristics of pool fire of petroleum fuels (McCaffrey, 1979; Bouhafid, Vantelon, Joulain, & Fernandez-pello, 1988; Hamins, Kashiwagi, & Burch Robert, 1996; Gupta, Kumar, & Kumar, 2002; Hall, 1973; Smith, & Cox, 1992). Resulting flames can be turbulent or laminar depending upon pool size and are usually buoyancy