Bryan W. Weber
Department of Mechanical Engineering
University of Connecticut
191 Auditorium Road U-3139
Storrs, CT 06269-3139

July 17, 2017

Dear Prof. Suuberg,

We wish to submit an original research article entitled “Experiments and Modeling of the Autoignition of Methyl Valerate at Low to Intermediate Temperatures and Elevated Pressures in a Rapid Compression Machine” for consideration by Fuel. This work has previously been published as a Master’s Thesis by Justin A. Bunnell, one of the authors, who completed his degree at the University of Connecticut in 2015. This work has not been considered for publication in a journal, and we have significantly extended the analysis in this manuscript.

In this paper, we report new experimental results for the autoignition delays of methyl valerate (methyl pentanoate), a methyl ester molecule and potential surrogate fuel for biodiesel. The experiments are conducted at conditions that have not been previously investigated in the literature. Specifically, we use a rapid compression machine to conduct experiments at engine-relevant low-to-intermediate temperature and high-pressure conditions. We find that methyl valerate exhibits a region of negative temperature coefficient of the ignition delay and two-stage ignition. To our knowledge, this is the first work to measure ignition delays throughout the NTC region for methyl valerate. In addition, we analyze two chemical kinetic models, one of which has been developed in this work, to determine their suitability for predicting ignition delays. We find that neither model is able to correctly predict the ignition delays, and we conduct path analysis to determine possible causes for the discrepancy. We believe that this manuscript is appropriate for publication by Fuel because it deals with the chemical reactions and combustion of methyl valerate. The results described in this manuscript will be of interest to the combustion community interested in modeling biodiesel combustion and developing devices utilizing biodiesel fuel.

We have no conflicts of interest to disclose. We suggest the following reviewers:

Dr. Goutham Kukkadapu
Scientist, Lawrence Livermore National Laboratory
kukkadapu1@llnl.gov

Prof. Mani Sarathy
Associate Professor, King Abdullah University of Science and Technology
mani.sarathy@kaust.edu.sa

Prof. Richard West
Assistant Professor, Northeastern University
r.west@neu.edu

Prof. Henry Curran
Professor, National University of Ireland, Galway
henry.curran@nuigalway.ie

Prof. Yiguang Ju
Professor, Princeton University
yju@princeton.edu

Please address all correspondence concerning this manuscript to me at
bryan.w.weber@gmail.com

Thank you for your consideration of this manuscript.

Sincerely,

Bryan W. Weber