Opportunity and Significance

Laminar burning velocity is a topic which has long been studied, but the accuracy and effectiveness of measuring techniques is still a widely debated topic. A strong understanding of the laminar burning velocity is important, because every flame begins as laminar and the initial laminar burning velocity characteristics determine properties of the final turbulent flame.

Technical Objectives

The objective of this research is to create a model which can properly simulate the reaction of ethanol in a constant volume chamber and accurately calculate laminar burning velocity. Additionally, two new ethanol mechanisms are tested using the newly developed model against experimental data to validate both the model and mechanisms.

Related Work and State of Practice

This work builds on the experimental work of multiple researchers as well as minimal simulation work. Experimental work in this area has proved the rigid constant volume combustion chamber to produce the most accurate results [4]. Additionally, Gulder has derived an equation which can calculate laminar burning velocity mathematically [2]. Finally, some modeling work has been done by Samimi et. al. previously [5].

Technical Approach, Accomplishments and Results

Next steps for this simulation include comparison against experimental data created by Samimi et. al. to further validate the mechanism. Additionally, this model will be used to validate laminar burning velocity calculations derived from experimental data.

Future Applications

This research, if further developed through experimental lab work, can be used for application in the automotive industry in order to better understand internal combustion characteristics. A more accurate measurement of laminar burning velocity can improve understanding of combustion dynamics and produce more data regarding laminar flame thickness, overall activation energy, and reaction order; all derived from this parameter.

References


