

5C04: PROPAGATION AND EXTINCTION OF PREMIXED DIMETHYL-ETHER/AIR FLAMES.

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In slice 13, flame speed measurement results of the same flame from different research groups were compared. All the experimental data are very similar. But still we can see that, there are some differences from groups. When we want to use the experiment data for the mechanism validation, for example, we have a very good mechanism, and we also have another bad mechanism. I think that, maybe the difference of the flame speed simulation result from the two mechanism sets is in the limit of the experimental data difference from different research groups. How can you select which group's experiment data to use for mechanism validation? Or let us say, how can you identify which experimental data set is more reliable for mechanism validation?

In the same figure, you have showed the error bar of your experiment data. But this error bar is much smaller than the data difference from different research groups. Could you please comment on this?

Flame speed is a very important and useful overall experiment result for mechanism validation. How can you define a good simulation result, comparing with experiment? How many percent differences from experiment data can be defined as good simulation result?

Reply by Y.L. Wang

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The discrepancy that is observed between the various reported experimental laminar flame speeds cannot be attributed simply to experimental uncertainty. It has been established in the recent literature, that some of those measurements contain some notable error. On the other hand, other measurements have been done in systems that do not necessarily conform to the definition of one-dimensional, laminar, steady, planar, adiabatic, stretch-free flame. The reported data in this investigation have been derived by using the best possible non-linear extrapolation approach and as such should be considered as very accurate. These data are of the same fidelity as the data derived by Ju and coworkers [20 in the paper] and Law and coworkers [21] in constant-pressure combustion chambers. This is further supported by the fact that the reported laminar flame speeds in this investigation are close in value to those obtained in the aforementioned studies [20,21 in the paper] using combustion chambers. Thus, the error bars of these three sets of data need to be considered, if a meaningful data comparison needs to be done. The issue of what data to use for model validation is a rather old one, and there is a plethora of papers in the literature that evaluate the quality of reported

laminar flame speeds over the last 20 years or so. In terms of model validation, the maximum experimental uncertainty of laminar flame speeds should not exceed 2 cm/s.