Combustion chemistry developments between experiments, modeling, and theory

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Abstract

Current research towards cleaner and more efficient processes in combustion builds significantly on the development of combustion models and their experimental validation. The combustion community increasingly establishes more or less detailed reaction mechanisms and combustion models for individual fuels or for yet underexplored operation conditions. Key issues include the mechanisms at low temperatures and/or high pressures, for conventional and alternative fuels or their mixtures, and for the formation of toxic species and soot emissions. While much of this research is fundamentally interesting, guidance may be desired regarding realistic expectations, for example when the pertinent combustion chemistry must be adapted to tractable sizes for technical environments. From an experimentalist's perspective, it is important to understand the potential of laboratory measurements for mechanism validation and the interplay between kinetics and diagnostics.

Recent collaborative examples will include species measurements in flames and reactors, especially to understand the oxidation behavior of individual fuels and dual fuel mixtures, and will include recent advances in isomer-selective detection. Discussion of some potentially controversial aspects and perceived trends will be suggested regarding species identification and quantitative concentration measurements as well as model validation and improvement.

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