

Opportunities for VUV FELs in Combustion Research

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Abstract:

Combustion is an inherently complex process in which a complicated network of many different species is connected through pressure- and temperature-dependent chemical reactions, fluid dynamics, and heat transfer. It is necessary to develop a detailed, molecular-level understanding of the ongoing chemistry in combustion processes in order to predict the pollution potentials of any given fuel and to eventually address future regulations on hazardous combustion emissions.

Over the last decade flame-sampling molecular-beam mass spectrometry has proven to be an essential tool for combustion chemistry studies, especially when equipped with synchrotron-generated vacuum-ultraviolet (VUV) radiation as a means to ionize the sampled combustion species. For example, formerly unexpected intermediates were identified to be important flame components and new pathways like unimolecular fuel decomposition and isomerization have been unraveled.

In this presentation, I will discuss the highlights of the previous work that was performed at the Advanced Light Source of the Lawrence Berkeley National Laboratory and I will present opportunities for VUV free electron lasers in combustion research.