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Exploring Combustion Chemistry in Laboratory-Scale Model Flames: From Biofuels to Soot Formation

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This presentation summarizes our recent experimental combustion chemistry studies that are focused on the understanding of the formation of aromatic species and their growth to polycyclic aromatic hydrocarbons (PAHs) and soot. In our experiments, premixed and non-premixed flames are analyzed by flame-sampling molecular-beam time-of-flight mass spectrometry employing photoionization by tunable vacuum-ultraviolet synchrotron radiation. Isomer-resolving photoionization efficiency curves and detailed modeling results reveal the influence of different fuel structures on the formation of aromatic compounds and their commonly considered precursors. Furthermore, the chemical composition of soot nanoparticles is investigated using aerosol mass spectrometry, which yields a comprehensive picture of the chemical composition of the sampled particles. The second part of the talk is concerned with the combustion chemistry of oxygenated, alternative fuels, specifically alcohols. Detailed kinetic modeling and quantitative mole fraction profiles of species from within *n*- and *iso*-butanol flames are combined to investigate the combustion of these next generation biofuels.