**A Comparative Kinetic Study of Methyl and Ethyl Ester Oxidation in Diffusion Flames.**

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The increasing proportion of eco-friendly biomass derived fuel in the transportation calls for a fundamental understanding of their oxidation and combustion properties. Among those fuels, Fatty Acid Ethyl Esters (FAEE) have received little attention since the current biofuel market is strongly oriented to Fatty Acid Methyl Esters (FAME). However, the recent investigations are driving public policies and biofuel producers to consider switching toward the production of FAEE as they have a higher well-to-wheel energy efficiency and a better greenhouse gases balance. Therefore, the present study aims to focus on this specific class of fuels. The extinction limits of four ethyl esters/air diffusion flames (ethyl- butanoate, pentanoate, heptanoate, and nonanoate) have been measured and compared with that of methyl esters of similar size (Diévart et al., 2012, Proceedings of the Combustion Institute, 34). The previous kinetic model developed for the methyl esters has been updated, and extended to encompass the oxidation subset of the ethyl esters herein investigated. The comparison of the experimental results in the transport-weighted enthalpy metric, which isolates the kinetic contribution to the extinction, reveals that both methyl and ethyl esters exhibit a similar high temperature reactivity, and therefore a similar resistance to extinction. The proposed model captures the experimental trend, and has therefore been used to interpret the experimental observations. The rate of production pathway analysis shows that ethyl esters have a distinctive oxidation scheme from methyl esters although they exhibit similar high temperature reactivity. The ethyl esters exclusively decompose through an endothermic six-centered unimolecular decomposition reaction to produce ethylene and a carboxylic acid, while the oxidation of the methyl esters preferentially progresses through H abstraction reactions. Nevertheless, the growth of the radical pool (OH, H, O) is observed to be driven indifferently between methyl and ethyl esters, thus resulting in an identical resistance against extinction.