PYROLYSIS OF ETHYL ESTERS IN A MICRO-REACTOR

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The nascent steps in the pyrolysis of ethyl esters have been studied in a set of heated micro-reactors. We have examined the thermal decomposition of ethyl propionate, $CH_3CH_2COOCH_2CH_3$, a model for biofuels. The micro-reactors are small (roughly 1 mm ID x 3 cm long) silicon carbide tubes; transit times through the reactors are about 100 μsec. Temperatures in the micro-reactors can be as high as 1700 K and pressures are typically 100 Torr. The products of pyrolysis are identified by a combination of 118.2 nm photoionization mass spectrometry and matrix isolation infrared absorption spectroscopy. We find there are two major pathways for ethyl propionate decomposition. These are: $CH_3CH_2COOCH_2CH_3 \longrightarrow CH_3CH_2COOH + CH_2{=}CH_2$ and $CH_3CH_2COOCH_2CH_3 \longrightarrow CH_3CH{=}C{=}O + CH_3CH_2OH$. The nascent pyrolysis products undergo further, extensive fragmentation in the reactor.