THERMAL DECOMPOSITION OF C\textsubscript{7}H\textsubscript{7} RADICALS; BENZYL, TROPYL, AND NORBORNADIENYL

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Benzyl radical (C\textsubscript{6}H\textsubscript{5}CH\textsubscript{2}) and two other C\textsubscript{7}H\textsubscript{7} radicals are commonly encountered in the combustion of substituted aromatic compounds found in biofuels and gasoline. High temperature pyrolysis of benzyl radical requires isomerization to other C\textsubscript{7}H\textsubscript{7} radicals that may include cycloheptatrienyl (tropyl) radical (\textit{cyc}-C\textsubscript{7}H\textsubscript{7}) and norbornadienyl radical. The thermal decomposition of all three radicals has now been investigated using a micro-reactor that heats dilute gas-phase samples up to 1600 K and has a residence time of about 100 \textmu-sec. The pyrolysis products exit the reactor into a supersonic expansion and are detected using synchrotron-based photoionization mass spectrometry and matrix-isolation IR spectroscopy. The products of the pyrolysis of benzyl radical (C\textsubscript{6}H\textsubscript{5}CH\textsubscript{2}) along with three isotopomers (C\textsubscript{6}H\textsubscript{5}\textsuperscript{13}CH\textsubscript{2}, C\textsubscript{6}D\textsubscript{5}CH\textsubscript{2}, and C\textsubscript{6}H\textsubscript{5}CD\textsubscript{2}) were detected and identified\textsuperscript{a}. The distribution of \textsuperscript{13}C atoms and D atoms indicate that multiple different decomposition pathways are active.