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Moving beyond feasibility in ultrafast shock chemistry experiments[1] MICHAEL ARMSTRONG, JAMES LEWICKI, JONATHAN CROWHURST, JOSEPH ZAUG, HARRY RADOUSKY, ELISSAIOS STAVROU, APRIL SAWVEL, Lawrence Livermore National Laboratory — Although ultrafast hydrodynamic methods to investigate the chemistry of shocked materials on ps to ns time scales are generally mature, questions about the interpretation of such experiments remain. Most ultrafast experiments employ shock etalon methods whose interpretation depends on assumptions about the index of refraction of the shocked state. Further, although signatures for chemistry in longer time scale time-of-flight (ToF) experiments are well understood, ultrafast chemistry experiments have not typically employed ToF methods. The use of ToF methods in ultrafast experiments would enable a more straightforward connection to longer time scale data, and would generally provide more information than shock etalon methods. Finally, ultrafast experiments have not been performed over time scales greater than a few hundred of picoseconds, significantly limiting the scope of experiments to observe shocked chemistry under typical conditions at larger length scales. Here we address all of these issues by presenting data from shocked polymers obtained using both ToF and shock etalon methods, using a 1 ns pump and observation window. We compare the results of these two methods to reconcile data from these different methods and strengthen the interpretation of both types of experiment.

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