PROGRESS ON SHOCKGAS-IR: MEASUREMENTS OF METHYL FORMATE AT ELEVATED TEMPERATURES

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Methyl formate plays an important role in multiple combustion mechanisms, such as the oxidation of dimethoxymethane, warranting further study of its absorbance spectra at elevated temperatures. However, pyrolysis reactions make broadband measurements at elevated temperatures difficult, and currently available spectra are mostly limited to lower temperatures around 296 K. In this study, we have shock heated methyl formate, dilute in argon, at temperatures up to 1000 K and measured the cross sections from 1655 to 1875 cm^{-1}. Measurements within the short ms-scale test times were achieved through a rapid-tuning, broad-scan external-cavity quantum-cascade laser. We have also supplemented these elevated temperature measurements with elevated pressure cross sections at room temperature in a static cell, at pressures up to 35 atm. Our measurements were validated through excellent 296 K agreement with that in the literature. The elevated temperature cross sections reveal an additional absorbance structure near 1800 cm^{-1}, possibly the emergence of a combination band. Interestingly, the cross sections at elevated pressure conditions display a dependence on pressure, contrary to its common use and implementation in previous literature. These cross sections expand our ShockGas-IR database (https://searchworks.stanford.edu/view/wt021dc3029), containing elevated temperature cross sections of many other molecules important for combustion mechanisms.