Determination of reaction intermediates and kinetics with high-resolution time-resolved dual-comb spectroscopy

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Time-resolved infrared laser spectroscopy, enabling to probe molecules with high sensitivity and sufficient spectral resolution, has emerged as a powerful tool to explore the reaction intermediates and kinetics. Here, a new approach to time-resolved infrared laser spectroscopy based on dual-comb interferometry will be reported. Employing a mid-infrared dual-comb interferometer coupled with a laser photolysis cell, multiple reaction species, including HO_2 and OH radicals were simultaneously detected in the spectral range near 2.9 μm for evaluating the rate constant of the reaction of HO_2 radicals with NO [1]. Furthermore, high-resolution spectral measurements of the short-lived molecules such as the simplest Criegee intermediate (CH_2OO) were implemented by utilizing another dual-comb source near 7.8 μm [2]. By operating the two sets of dual-comb interferometers synchronously, investigations on the underlying reaction mechanisms and pathways involving the CH_2OO and leading to the formation of the OH and HO_2 radicals were also presented [3].

[1] P.-L. Luo and E.-C. Horng, *Commun. Chem.*, 3, 95 (2020).
[2] P.-L. Luo, *Opt. Lett.*, 45, 6791 (2020).
[3] P.-L. Luo and I-Y. Chen, *Anal. Chem.* 94, 5752 (2022).