RAPID FREQUENCY-COMB INFRARED SPECTROSCOPY WITH CROSS-DISPERSED SPECTROMETERS

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Time-resolved spectroscopy with optical frequency combs combines rapid acquisition with high sensitivity, broad bandwidth, and high resolution.[a] This presents an opportunity to study chemistry on a microsecond timescale with molecular specificity and multiplexing. Here we introduce two cross-dispersed frequency comb spectrometers operating in two wavelength regions of the infrared: one from 1.5 μm to 1.7 μm and another from 4.4 μm to 4.7 μm. In the latter mid-infrared region, we resolve the ro-vibrational lines of several isotopocules of nitrous oxide (N_2O), demonstrating a spectrometer-limited resolution of 725 MHz.[b] Improvements in spectrometer design, beginning in the former near-infrared region, allow for individual frequency-comb teeth to be resolved. Applied in combination with fast-frame-rate camera technology and emerging solid-state or frequency-agile comb sources, the result is a high-throughput spectroscopic technique that is well-suited for investigating the dynamic chemistry of individual events.

[a] A. J. Fleisher, B. J. Bjork, T. Q. Bui, K. C. Cossel, M. Okumura, J. Ye, *J. Phys. Chem. Lett.* **5,** 2241–2246 (2014)

[b] D. M. Bailey, G. Zhao, A. J. Fleisher, *Anal. Chem.* **92,** 13759–13766 (2020)