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Coherent two-dimensional infrared microscopy CARLOS BAIZ, DENISE SCHACH, ANDREI TOKMAKOFF, Univ of Chicago — We developed ultrafast 2D IR spectral microscopy, a new technique to measure spatially-resolved 2D infrared spectra and vibrational dynamics with diffraction-limited spatial resolution and femtosecond time resolution. The key enabling development consists of a new geometry where all three IR pulses propagate fully collinearly through an all-reflective IR microscope. A combination of polarization, chopping, and phase-cycling isolate the 2D IR signal by removing all unwanted signal and interference contributions. The single-beam collinear geometry enables us to implement 2D IR in three configurations: transmission, reflectance, and ATR. In terms of sensitivity, the 6 micron focus size produces an 8-fold enhancement of the signal compared to focusing with standard parabolic mirrors. These methods open up new possibilities for imaging proteins in cells, lipid membranes, or vesicles, as well as performing surface-sensitive studies on biological systems.

Carlos Baiz
Univ of Chicago

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