DETERMINING REACTION MECHANISMS AND TRANSITION STATE GEOMETRIES IN LIQUIDS USING ONE AND TWO DIMENSIONAL ULTRAFAST VIBRATIONAL SPECTROSCOPY

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Both the thermal and photochemically driven reactions of organometallic complexes in solution can be readily examined with ultrafast one-dimensional (1D-IR) and two-dimensional infrared (2D-IR) vibrational spectroscopy. We show, for example, how the thermally-driven exchange of carbonyl groups in $Fe(CO)_5$ (i.e. fluxionality) can be monitored with 2D-IR, providing direct evidence for the time-scale and transition-state of the exchange reaction. Applications of 1D and 2D-IR to photoinitiated chemical reactions will also be discussed.