The project deals with the set-up of a new laboratory for the development and application of a novel spectroscopic instrument: a Femtosecond Stimulated Raman Scattering (FSRS) spectrometer tunable in the visible/ultraviolet range. One of the holy grails of time-resolved optical spectroscopy is being able to make the “molecular movie”, i.e. watch in real time how the molecular structure evolves following an excitation pulse triggering a photochemical/photophysical process. Transient absorption spectroscopy does not have structural sensitivity and can only provide indirect information on photoinduced structural dynamics. Raman spectroscopy, by monitoring the frequencies and strengths of vibrational bands, has exquisite structural sensitivity but is generally limited to stationary spectra. Time-resolved Raman can provide temporal resolution, but this is generally limited to a few picoseconds by the need to use narrowband excitation pulses in order to achieve frequency resolution. FRSR is a technique which
transcends this limitation by the combination of a coherent Raman process (stimulated Raman scattering, SRS) with a femtosecond pump pulse (the actinic pulse) initiating a photochemical reaction, and achieves simultaneously high temporal (30-fs) and spectral (<10 cm⁻¹) resolution. As such, it allows accessing a previously unavailable temporal window in photoinduced structural dynamics.

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