Structural and Dynamical properties probed by Ultrafast Infrared Spectroscopy

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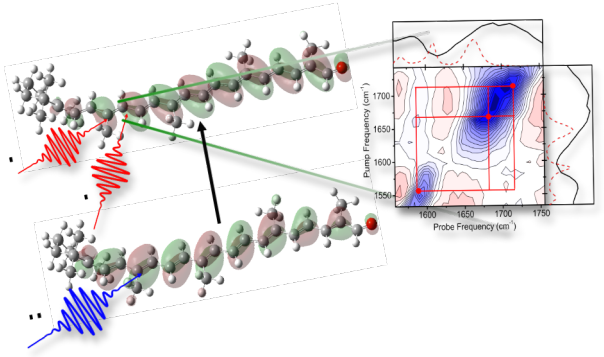
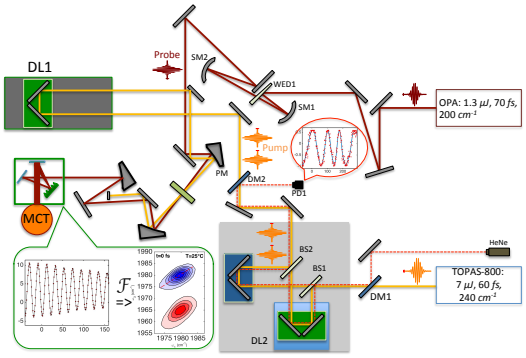
Molecules, whether they are in the gas phase or in the condensed phase, are characterized by collective motions that define their overall properties. In the condensed phase, collective motions often influence the structural properties giving rise to a synergy of effects: local dynamics can influence the macroscopic properties of the system and vice versa.
Molecular motions run over a large time scale ranging from the characteristic times of molecular vibrations (femtoseconds) to molecular rotations and collective vibrations (picoseconds), thermal and electronic relaxation processes (nanoseconds) to then arrive at the motions of protein systems (microseconds) and folding / unfolding processes (milliseconds). The characterization of the various processes requires experimental techniques with a temporal resolution suitable for the phenomenon we are studying. In particular, the study of vibrational, rotational and slower dynamics such as the structural rearrangement of protein systems fall under the name of "structural dynamics". From an experimental point of view, these processes can be characterized by Ultrafast time-resolved infrared spectroscopy.



In this talk I will show you some examples in which Ultrafast Infrared Spectroscopy has proved to be a particularly useful technique in the study of the dynamic and structural properties of molecular systems in the ground and in the excited electronic state. I will also review some recent advances In Time Resolved Infrared Spectroscopy. [1-5]



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