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Strong laser field control of the dynamics and stereodynamics of molecular photodissociation

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Experiments aimed at understanding ultrafast molecular processes are now routine, and the notion that external laser fields can constitute an additional reagent is also well established. The possibility of externally controlling a reaction with radiation increases immensely when its intensity is sufficiently high to distort the potential energy surfaces at which chemists conceptualize reactions take place [1]. In recent experiments, we have studied strong laser field control scenarios of ultrafast molecular photodissociation dynamics. The control has been exerted on different observables of the photochemical reaction, such as quantum yields [2,3] and lifetimes [2] or even on fragment translational energies [3]. The case study involves photodissociation of the polyatomic prototype methyl iodide (CH3I), whose ultrafast photodissociation dynamics has been studied in our laboratory for some years both in the A-band [4,5] and B-band [6], under strong femtosecond or picosecond near-IR laser pulses [2,3]. The control is achieved by opening new strong-field-induced reaction channels [2] or by creating light-induced conical intersections and modulating the potentials around them by light-induced potentials [3]. In particular, control of the fragment spatial distribution (the stereodynamics) in the predissociation of methyl iodide has been achieved by using strong picosecond laser pulses [7] and the results will be presented at the Conference.

References

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Primary author: BAÑARES, Luis (Universidad Complutense de Madrid)

Presenter: BAÑARES, Luis (Universidad Complutense de Madrid)

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