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Kim, Sang Kyu

2020

Kim, S. K. (2020). Time-resolved reaction dynamics in photo-dissociation and photo-detachment. Proc. Of the 7th Asian Spectroscopy Conference (ASC 2020).
doi:10.32655/ASC_8-10_Dec2020.38

<https://hdl.handle.net/10356/144284>

https://doi.org/10.32655/ASC_8-10_Dec2020.38

Time-Resolved Reaction Dynamics in Photo-dissociation and Photo-detachment

Sang Kyu Kim

Department of Chemistry, KAIST, Daejeon (34141), Korea

E-mail: sangkyukim@kaist.ac.kr

Abstract

Nonadiabatic dynamics are ubiquitous in nature. We are going to introduce some unique examples where we could investigate nonadiabatic transition processes at the molecular level in both spatial and temporal domains. Photo-induced processes including predissociation, tunneling, nonradiative transitions of internal conversion and intersystem crossing, or photo-detachment are quite closely associated with nonadiabatic transitions especially in the vicinity of conical intersections. As the conical intersection is multi-dimensional in nature, it is usually not straightforward to define the strong coupling region by any means. We are here demonstrates that it is quite possible to prepare the reactive flux at the proximity of the conical intersection volume, and unravel the detailed nonadiabatic bifurcation dynamics mechanism in molecular details. Various experimental tools such as resonant-enhanced ionization, Stark-deflection, hole-burning, IR+UV double resonances, (slow) velocity-map ion/electron imaging (VMI), or picosecond/femtosecond time-resolved pump-probe VMI have been employed to unravel the microscopic mechanism of the excited-state chemistry of neutrals and anionic species at 1 or 35 K, respectively. Spectroscopic technique has pros and cons in terms of structural identification. Here, we are going to show how we could possibly characterize structures of the conical intersections or transition states where the molecule stays only briefly in the (3N-6) normal mode space where N is the number of atoms in polyatomic systems.

Keywords: conical intersection, dipole bound state, anion, photodetachment

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