教師簡介資料

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研究興趣與成果(中/英文)

我們實驗室多來年的研究方向是利用同步輻射的真空紫外光研究大氣和星際化學中重要分子或自由基在氣相中的高激發態吸收能譜和光游離解離反應。主要建立的兩個實驗系統和規劃的研究是(1)利用連續分子束/門檻光電子-光離子同現實驗系統，進行門檻光電子-光離子同現光譜的實驗量測，並結合理論計算，研究特定離子的解離產物性質及機制。(2)利用分子射束真空紫外吸收實驗系統，進行光吸收能譜的測量，並結合理論計算，研究電子共價激發能態和高雷德堡能態的電子組態特徵和能量。

實驗室自去年起發展新研究方向，主要發展時間–空間解析的螢光顯微光譜，研究生物分子間的能量傳遞、作用力和動力學性質，未來將進一步進行活體量測。目前已建立一套以連續式雷射和飛秒雷射爲激發光源的單光子/雙光子共軛焦螢光顯微系統，也進一步結合飛秒雷射的時域特性，建立具有快速時間解析的螢光生命曲線量測系統。正在努力的方向是發展高空間解析螢光顯微技術，如structured illumination 和 nonlinear structured illumination技術，以突破繞射極限的限制，應用於活細胞影像之研究。

In the past several years, we have focused our studies on the highly excited states and dissociative photoionization of species of importance in the atmospheric and interstellar chemistry with various techniques – photoabsorption, photoionization mass spectroscopy (PIMS) and threshold photoelectron-photoion coincidence (TPEPICO) – coupled to the synchrotron radiation in the vacuum ultraviolet region. Two experimental systems – molecular-beam / threshold photoelectron-photoion coincidence system and jet/photoionization mass spectrometry system have been setup to perform the measurements. Calculations with TD-DFT, OVGF and Gausssian-3 methods were also carried out using the Gaussian 2003 program to aid in interpreting the absorption spectra and in understanding the dissociative photoionization properties and mechanisms.

Recently, we explore our research direction toward the energy-transfer processes and interactions of biological molecules with time- and spatially-resolved fluorescence microscopy. Combined with a femtosecond Ti:S laser, we have setup a one/two-photon confocal microscopy with a nanosecond time-resolved detection system. Developing superresolution light microscopy, down to sub-100 nm levels, is on going by using structured illumination and nonlinear structured illumination techniques for applications in the studies of living cell images.

Selected Publications

1. **S.-Y. Chiang***, Y.-C. Lee, and Y. P. Lee, "Formation of CH_3CFCl^+ form photoionization of

CH_3CFCl_2: an application of threshold photoelectron photoion coincidence (TPEPICO) technique", J. Phys. Chem. A. **105**, 1226 (2001).

2. **S.-Y. Chiang***, M. Bahou, Y.-J. Wu and Y.-P. Lee, "Experimental and theoretical studies on Rydberg states of CH_2CO in the region 120-220 nm", J. Chem. Phys. **117**, 4306 (2002).
3. **S.-Y. Chiang***, M. Bahou, K. Sankaran, Y.-P. Lee, H.-F. Lu, and M.-D. Su, "Dissociative photoionization of CH_2Cl_2 and enthalpy of formation of $CHCl^+$: Experiments and calculations", J. Chem. Phys. **118**, 62 (2003).
4. **S.-Y. Chiang***, Y.-S. Fang, M. Bahou, and Y.-P. Lee, "Experimental and quantum-chemical studies on photoionization and dissociative photoionization of CH_2Br_2", J. Chem. Phys. **120**, 3270 (2004).
5. **S.-Y. Chiang*** and I.-F. Lin, "Experiments and quantum-chemical calculations on Rydberg states of H_2CS in the region 5.636–9.537 eV", J. Chem. Phys. **122**, 94301 (2005).
6. Y.-S. Fang**,** I-F. Lin, Y-C. Lee, and **S.-Y. Chiang***, "Dissociation of energy-selected c-$C_2H_4S^+$ in a region 10.6–11.8 eV: threshold photoelectron–photoion coincidence experiments and quantum-chemical calculations", J. Chem. Phys. **123**, 054312 (2005).
7. **S.-Y. Chiang***, Y.-S. Fang, and C.-N. Lin, "Dissociation of energy-selected c-$C_3H_6S^+$ with threshold photoelectron–photoion coincidence experiments and calculations", Chem. Phys. Lett. 422, 475 (2006).