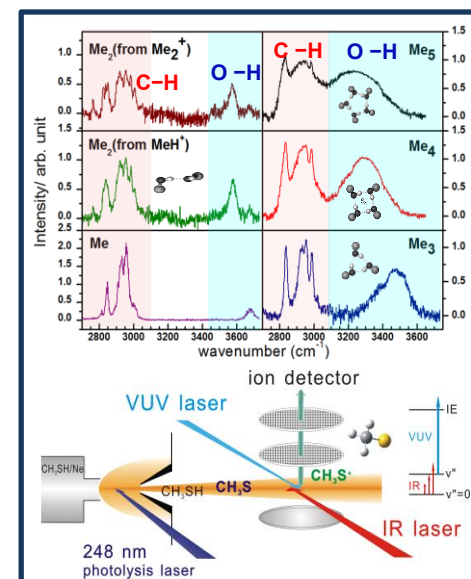


## Prof. Yuan-Pern Lee / Department of Applied Chemistry

### Free Radicals, Atmospheric/Combustion/Planetary Chemistry, Time-resolved Infrared, Photoionization, Matrix Isolation

We are interested in unstable species or free radicals that are important in atmospheric, combustion, or planetary chemistry, but are difficult to detect using conventional techniques. We study their spectroscopy, kinetics, and dynamics experimentally and use theoretical computations to help. Representative techniques are: **(a) Step-scan FTIR:** In the absorption mode, we detect reaction intermediates such as Criegee intermediates  $\text{CH}_2\text{OO}$  and their reaction intermediates. In the emission mode, we observed the rotational and vibrational states of products in photodissociation or bimolecular reactions to understand their dynamics. **(b) Mass-selected IR:** We used VUV photoionization/time-of-flight mass to detect ions. By observing the variations in signals of various ions when a tunable IR laser is applied prior to ionization, we can derive mass-selected IR spectra of clusters or free radicals. **(c) Para-hydrogen Matrix Isolation:** Para-hydrogen, a quantum solid, has emerged as a novel matrix host for investigating unstable species at 3 K. Taking advantage of its diminished cage effect, we produced various free radicals and detect them by IR or fluorescence. **(d) Ultrafast Spectroscopy:** Investigate dynamics of materials or solutions in femtosecond range.

**Key Facilities:** femtosecond laser systems, excimer lasers, Nd:YAG lasers, dye lasers, IR lasers, step-scan FTIR, cryogenic systems (3K or 10K), TOF-mass, cavity ringdown systems.



IR-VUV ionization/time-of-flight detection

