# *Chemical Reactions in Helium Droplets: Past Successes and Future Prospects*

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The helium nanodroplet isolation method has been applied by several research groups to the study of chemical reactions, such as ion-molecule reactions, aggregation-induced transformations, and bond-forming barrierless reactions. Of course, the droplet method has also provided a versatile platform to study weakly bound 'entrance-channel' complexes, stabilized behind small barriers above the asymptotic energy of a bimolecular reaction. One of the goals of our field is to exploit helium droplets to study the photo-induced chemistry of these highly metastable species, which potentially can provide significant insight into issues such as bright state-reaction coordinate coupling and the mode-specificity of product branching ratios when multiple outcomes exist.

This talk will review some of the past successes and future prospects for studying chemistry in helium droplets. Infrared laser Stark and Zeeman spectroscopy has been applied in our group to several hydroxyl radical containing entrance-channel complexes. Recent results on these fascinating systems will be presented. These spectra highlight an already well-know, yet still amazing, truth about helium droplets: the rovibrational spectra of weakly bound open-shell systems can be satisfactorily simulated by assuming a gas-phase effective Hamiltonian.