Laser Ablation of Alkali-Halides: Toward Understanding Ionic Dissociation at a Molecular Level

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Molecular Clusters: Fundamental Chemistry
- Systems for understanding the transition from individual molecules to condensed matter

MOLECULE → CLUSTER → BULK

Molecular Clusters: Environmental Science
- Molecular Clusters help understand fundamental interactions relevant to:
  - Processing of tropospheric chlorine by atmospheric sea-salt aerosol
  - Formation of Acid Rain
  - Ozone Chemistry

We use microwave (rotational) spectroscopy to study molecular clusters.

What is rotational spectroscopy?
- Most accurate method of determining 3D geometry of small molecules
- Provides information about molecular and electronic structure
- (Right) Structure of H$_2$SO$_4$-H$_2$O complex with the bond lengths and bond angles

Pulsed-Nozzle Fourier Transform Microwave Spectroscopy (FTMW)

- Basic Setup
- Optical Pathway
- Spectrometer
- Frequency Doubled Nd:YAG Laser
- Heterodyne Detection
- Digitization and Fourier Transform

Gas

MW Pulse

Free Induction Decay

Mech. Pump

Diffusion Pump

MW Synthesizer

39K$^{127}$I – Observing Transitions

KI transition peaks

What lies in store
- The study of hydrated complexes as a fundamental problem in cluster science
- Studying alkali-halide water complexes with water is our next goal

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