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Application Of An Optical Parametric Oscillator For Infrared Spectroscopy Of Jet-Cooled Molecules And Complexes.

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Van der Waals interactions are fundamental for molecular reactions such as aerosol formation, adsorption of atoms and molecules on surfaces, protein conformation and many more. Infrared absorption spectra of weakly-bound van der Waals complexes provide the necessary information to develop inter-molecular potential energy surfaces. During the past five years, our group has been systematically investigating the infrared spectra of weakly bound dimers and larger clusters formed from CO₂, N₂O, OCS, CS₂ and C₂H₂. The goal is to collect spectroscopic data against which theory can be benchmarked.

In 2013 our group developed and implemented a state of the art Optical Parametric Oscillator (OPO) based spectrometer for studying these intermolecular forces. The work presented will aim to explain the implementation of this OPO system and the process through which data is acquired. The main parts of the system, such as the cluster formation, probe laser and data processing, will be explained. Lastly some of the results will be shown demonstrating the efficacy of this method and the reliability of our setup as source for high-resolution and high-sensitivity spectroscopy of van der Waals molecular complexes.

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