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# Cold Complexes and Hot Particles - Mixing Laser Spectroscopy and Mass Spectrometry

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Mass spectroscopy has revolutionized chemistry by providing information on molecular structures, reaction mechanisms, and molecular energetics for molecules ranging from simple diatomics to proteins and peptides. Similarly, molecular laser spectroscopy has given us precise, quantitative data on molecular structures and molecular concentrations. This talk will focus on two experiments in which mass spectrometry and laser spectroscopy are married to characterize charged molecules and particles. The first part will cover the laser-based infrared spectroscopy of mass-selected  $M^+H_2$  complexes ( $M^+=Li^+, Na^+, B^+, Al^+, Mg^+, Mn^+, Zn^+$ ). The infrared spectra are recorded by monitoring  $M^+$  photofragments and deliver detailed information on the manner in which  $H_2$  molecules are attached to metal cations. The second part of the talk will describe recent investigations of small, charged graphite particles confined in a quadrupole ion trap. When exposed to intense laser radiation, the graphite particles emit black-body radiation which can be spectrally analysed to give the particles' temperature. We have also investigated particle cooling, due to collisions with a surrounding buffer gas, and oxidation and disappearance in the presence of  $O_2$ .