INFRARED SPECTROSCOPY OF IONS IN SELECTED ROTATIONAL AND SPIN-ORBIT STATES

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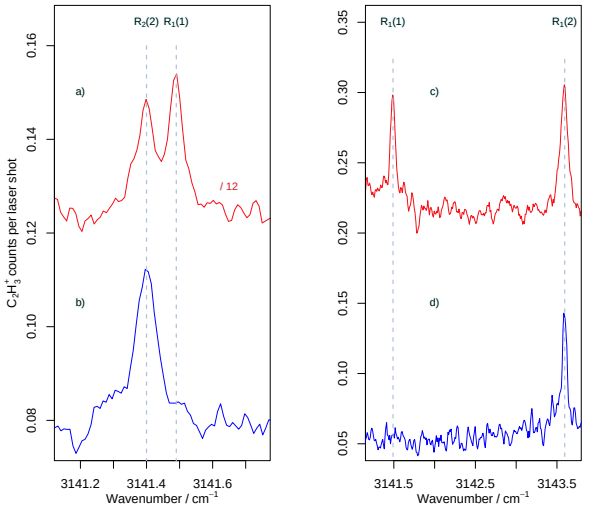
First results are presented obtained using an experimental setup developed to record IR spectra of rotationally state-selected ions. The method we use is a state-selective version of a method developed by Schlemmer *et al.* [a] to record IR spectra of ions.

Ions are produced in specific rotational levels using mass-analysed threshold ionisation (MATI) spectroscopy combined with single-photon excitation of neutral molecules in supersonic expansions with a vacuum-ultraviolet laser. The ions generated by pulsed-field ionisation of Rydberg states of high principal quantum number ($n \approx 200$) are extracted toward an octupole ion guide containing a neutral target gas. Prior to entering the octupole the ions are excited by an IR laser. The target gas is chosen so that only excited ions react to form product ions. These product ions are detected mass selectively as function of the IR laser wavenumber.

To illustrate this method, we present IR spectra of $C_2H_2^+$ in selected rotational levels of the $^2\Pi_{3/2}$ and $^2\Pi_{1/2}$ spin-orbit components of the electronic ground state.



IR spectra of $C_2H_2^+$ with(b, and d) and without (a, and c) selection of the rotational state by MATI.

[a] Schlemmer *et al.*, J. Chem. Phys. **117**, 2068 (2002)