

LEAK-OUT SPECTROSCOPY OF THE C-C STRETCHING MODES OF C_3H^+ , $NCCO^+$ AND HC_3O^+

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High-resolution ro-vibrational spectra of the C-C stretching fundamentals of C_3H^+ , $NCCO^+$, and HC_3O^+ are recorded using the leak-out action spectroscopy method in the 22-pole ion trap apparatus COLtrap II. In this experiment parent ions are mass selected prior to storing them in the cryogenic ion trap. Here they are cooled to the ambient temperature by collisions with a pulse of Helium buffer gas. A mode-hop-free quantum cascade laser emitting at around $5\mu\text{m}$ is used to excite the desired molecular vibrations. N_2 is used as second collision partner which is provided continuously to the cold trap. The trap is kept at a nominal temperature of 40 K in order to avoid freezing of the gas. The vibration to translation (V-T) energy transfer of the excited ions leads to a loss of those ions via an electrostatic barrier at the exit electrode. A spectrum is recorded with high S/N ratio by measuring the number of lost ions as a function of the excitation frequency. Nicely resolved P- and R- branches for the three linear molecular ions are observed with rotational, i.e. collisional temperatures slightly larger than the trap temperature and with line widths slightly exceeding the corresponding Doppler-widths. Accurate molecular parameters are determined from these measurements. Thanks to the high sensitivity of our experimental approach also hot-band transitions as well as combination bands can be identified in favorable cases. Results from these experiments will be presented.