ROVIBRATIONAL SPECTROSCOPY OF CHIRAL MOLECULES

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It is of fundamental interest to demonstrate molecular parity violation[a]. A first step towards promising spectroscopic experiments[b] on parity violation in chiral molecules is the analysis of a high resolution infrared or optical spectrum. Because of the inherent complexity of such spectra so far very few such analyses have been carried out, to our knowledge all in the Zürich group.

We will present spectra recorded with our Zürich Bruker 2001 prototype Fourier transform infrared spectrometer[c] of CDBrClF and the isotopic chiral molecules $CH^{35}Cl^{37}ClF$ and D_1-Oxirane[d]. We were able to analyse the spectra in the CO_2-Laser regions, the ν_6, $2\nu_8$, ν_5, ν_4, ν_3, $(\nu_6+\nu_8)$ bands of CDBrClF, the ν_4, $(\nu_5+\nu_9)$ bands of $CH^{35}Cl^{37}ClF$ and the ν_8 band of D_1-Oxirane. Ultra-high resolution laser spectroscopy can be applied in this region.

A recent connection of a cooling cell to our Bruker FTIR spectrometer made it possible to analyse the first overtones of the CF stretching modes of CDBrClF and $CH^{35}Cl^{37}ClF$. These overtone spectra are of interest because quasiresonant two photon CO_2 laser spectroscopy can be used in this spectral region. Based on our assignments we also propose that rotational spectroscopy carried out with backward wave oscillators is a promising way to measure molecular parity violation for heavier molecules. First theoretical predictions for such rotational spectral shifts exist[e].

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