Karlsruhe Institute of Technology

Tritium Laboratory Karlsruhe

M.Th/ B.Th

Precision spectroscopy of ^{3}HNCO

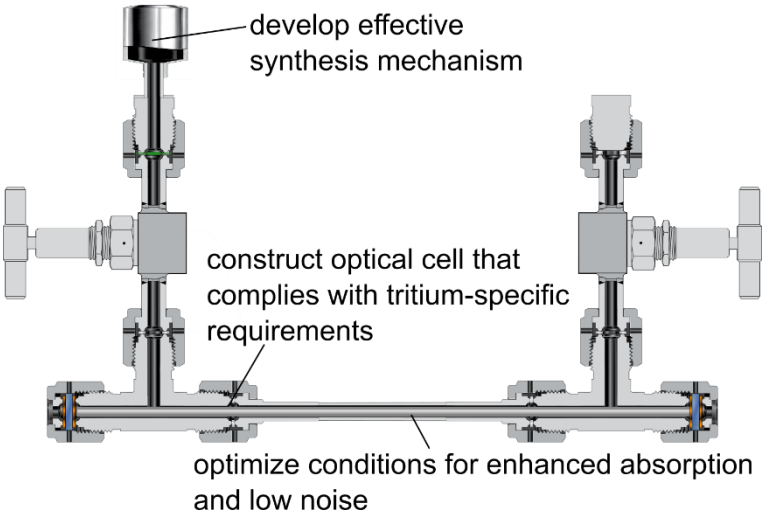
Motivation

Exchanging the hydrogen with tritium (^{3}H) in molecules (here HNCO) drastically influences the rotational and vibrational energy structure in the molecule. Therefore, high-resolution infrared spectra of so-called *tritiated* molecules allow for fundamental tests to quantify these isotope shift effects.

To obtain high-resolution spectra, an optical cell for Fourier transform infrared spectroscopy (FTIR) needs to be developed, synthesis must be prepared and performed and measurements performed and resulting spectra analysed!

Your task

- Develop an optical cell that complies with the requirements regarding the synthesis, optical properties, and tritium-compability.
- Develop an effective synthesis
- Measure spectra using FTIR-spectrometry.
- Calibrate the spectra using absorption signatures of precisely known species (e.g. CO_2, CH_4,…).
- Assign, yet not measured, absorption signatures from ^{3}HNCO using a modifiable python-software.
- Analyse data and derive a quantum-mechanical model for the rotational and vibrational states of tritiated methane species.



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