

MANIPULATION OF COLD CHIRAL MOLECULES USING ELECTRONIC AND ROTATIONAL SPECTROSCOPY

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The two non-superimposable mirror images of a chiral molecule are referred to as enantiomers. Their structures cannot be transformed into each other by pure translation or rotation. Even though most physical properties of enantiomers are identical – which makes them intrinsically difficult to separate – their handedness often determines their functionality. Chiral analysis, particularly for complex samples, is still challenging, thus there is a need for fast and reliable methods that can differentiate and/or separate enantiomers. Recently, the enantiomer-specific state transfer method¹ was developed. This method provides the means to populate or depopulate a rotational state of a chosen enantiomer. We have designed, built, and characterized a compact spectrometer capable of performing chirped-pulse Fourier transform microwave spectroscopy, including chiral analysis, and electronic spectroscopy. By combining optical methods with microwave spectroscopy, we seek to maximize the state-specific enantiomeric enrichment. Our recent studies mainly focus on the chiral alcohol 1-indanol. We have acquired and understood its rotationally resolved electronic spectra,² as well as performed microwave-UV double resonance measurements. The gained structural insight serves as a foundation for future, more sensitive enantiomer-specific measurements. I will discuss recent experimental results as well as details of our new experimental setup.

¹Eibenberger, S. et al., *Phys Rev Lett* 118, 123002 (2017). ²Hernandez-Castillo, A. O. et al., *Phys Chem Chem Phys*, (2021).