MID-INFRARED CAVITY RING DOWN SPECTROMETER WITH A LEAD SALT DIODE LASER

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We report the design and construction of a mid-infrared cavity ring down spectrometer in combination with a pulsed slit molecular beam, for the infrared spectroscopic studies of chiral diastereomers formed in a molecular beam environment. Lead salt diode lasers are currently the most common and most affordable mid-infrared laser sources. They are available in the frequency region from 1000 to 3250 cm^{-1}. Each diode covers a few cm^{-1}, albeit with spotty coverage. In this talk, we will discuss the challenges of implementing a lead salt diode laser into a cavity ring down spectrometer. Because of the transient nature of a cavity ring down measurement and the use of a pulsed molecular beam, it is essential to ensure that the molecular pulse and the laser buildup in the cavity coincide. To do this, we developed LabVIEW based control software that is based on a passive mode locking scheme and allows us to actively chase the cavity buildups. Experiments were performed at 3000 cm^{-1}. The standard deviation of the cavity ring down time for an individual ring down fit is in the order of 0.1%, while the shot-to-shot variation of the ring down time is a few percent. Example spectra of methane and methane complexes will be presented.