CAVITY RING DOWN AT LOW TEMPERATURES: VIBRATIONAL OVERTONE ABSORPTION OF DEUTERATED METHANES AT 110 K

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The C-H stretch overtone absorptions of ($\Delta\upsilon = 5$) of CH_4, CH_3D, CH_2D_2, and CHD_3 have been obtained using the phase shift cavity ring down technique. A low temperature cell was designed and adapted to the CRD experiment to measure absorption bands at any temperature between 10 K and 298 K. The spectra were obtained at room temperature and at 110 K. The partially resolved rotational spectrum of CHD_3 that included the transitions $5\nu_1$ and $4\nu_1 + 2\nu_5$ was obtained and compared with the calculated spectrum. The unresolved vibrational bands around the $\Delta\upsilon = 5$ region of CH_2D_2, CH_3D, and CH_4 were also obtained at several temperatures between 100K and 298 K. The integrated absorption was calculated as a function of the density of the gas samples and used to obtain the cross section and the oscillator strength of the transition for each molecule.