FAR INFRARED HIGH RESOLUTION SYNCHROTRON FTIR SPECTROSCOPY OF THE LOW FREQUENCY BENDING MODES OF DMSO

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In addition to its importance for industrial and environmental studies, the monitoring of DiMethylSulfOxyde (DMSO, $(CH_3)_2SO$) concentrations is of considerable interest for civil protection. The existing high resolution gas phase spectroscopic data of DMSO only concerned the pure rotational transitions in the ground state.[a] In the Far-IR domain, the low-frequency rovibrational transitions have never previously resolved.[b] The high brightness of the AILES beamline of the synchrotron SOLEIL and the instrumental sensitivity provided by the multipass cell allowed to measure for the first time these transitions.[c] 1581 A-type and C-type transitions in the ν_{11} band have been assigned and 25 molecular constants of Watson's s-form hamiltonian developped to degree 8 have been fitted within the experimental accuracy. The use of then synchrotron radiation has opened many possibilities for new spectroscopic studies. Together with several other recent studies, our successful measurement and analysis of DMSO convincingly demonstrates the potential of the AILES beamline for high resolution FIR spectroscopy. Thus our present work is just at the beginning of unraveling the rovibrational structure of low frequency bending and torsional vibrational states of DMSO and yielding important comprehensive structural and spectroscopic information on this molecule.

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