HIGH RESOLUTION SPECTROSCOPY OF HEXAMETHYLENETETRAMINE (HMT) $C_6N_4H_{12}$

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Hexamethylenetetramine, or HMT ($C_6N_4H_{12}$) is a N-substituted derivative of adamantane $C_{10}H_{16}$ which is the smallest sample of the diamondoid molecules family. Thanks to their high stability, diamond-like molecules have long been suspected to be present in space[b] (note that diamond nanocrystals are extracted from Murchinson meteorites[c]), and HMT is known to be an abundant residue of UV irradiated ice analogs[d] and might be present in Titan's atmosphere. Using the Bruker IFS 125 coupled to a multipass cell (absorption path length of 150 m) of the AILES beamline at SOLEIL, we recorded the IR spectrum of gas phase HMT in the 300–3000 $cm^{-1}$ spectral region with an unapodized resolution 0.001 $cm^{-1}$. HMT is a solid powder with about 0.008 mbar vapour pressure at room temperature, it is a $T_d$ molecule (as adamantane) and has 25 vibrational modes from which only 9 are infrared active. Over the 9 IR active modes, we were able to rotationlly resolved the spectra of 6 of them.
The analysis of all the resolved bands has been performed thanks to the XTDS and SPVIEW softwares developed in Dijon for such molecules[e]. Each band can be considered as isolated and we get very good fits of line positions, with a root mean square deviation better than $5 \times 10^{-4}$ $cm^{-1}$ for $J$ values up to 80 or more in each case. As for our recent study concerning adamantane[f], the resulting synthetic spectra will permit an active search of this very stable specie in different sources of the interstellar medium.

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