

MILLIMETER/SUBMILLIMETER SPECTRUM AND INTERSTELLAR SEARCH FOR SINGLY DEUTERATED METHYL MERCAPTAN, CH₂DSH

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Methyl mercaptan, CH₃SH, has been detected in the interstellar medium (ISM) with abundances that make detection of minor isotopic species, like the deuterated isotopologues, plausible (e.g.^a). Isotopologue abundance ratios are pivotal for tracing the origin and evolution of the molecular material in the process of star and planet formation. The search for deuterated isotopologues of CH₃SH, however, is limited by the lack of spectroscopy on these molecules. The microwave spectra of CH₂DSH and CHD₂SH have been reported, but provides insufficient rotational information for extension up to higher frequencies needed for astronomical observation^{b,c}. Therefore, additional spectral information is required for their interstellar identification. We have recently collected the millimetre spectrum of CH₂DSH from 70 and 500 GHz to provide the necessary spectral information for its detection in the ISM. The analysis of this spectrum, however, is complicated by the hindered torsional rotation of the CH₂D group. The torsional potential resulting from this internal motion has three minima corresponding to three different substates, two *gauche* (e_0 and o_1) and one *anti* (e_1). We have, so far, identified and assigned about 800 transitions including the dominant *a*-type R branch band structure of all three substates, the weaker *b*-type Q branch transitions as well as transitions between the torsional substates. We will present on the spectral analysis of CH₂DSH as well as the results of our first search towards low-mass star-forming regions.

^aDrozovskaya, M. N., *et al.*, MNRAS, 476, 4 (2018)

^bSu, C. F., and Quade, C. R., JCP, 79, 5828, (1983)

^cSu, C. F., Liu, M. J., and Quade, C. R., JMS, 158, 21 (1993)