

THE PURE ROTATIONAL SPECTRUM OF THE HYDROXYMETHYL RADICAL REINVESTIGATED TO ENABLE ITS INTERSTELLAR DETECTION

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The hydroxymethyl (CH_2OH) and methoxy (CH_3O) radicals, products of CH_3OH photodissociation, are considered key reactive intermediates in the interstellar medium (ISM), and their recombination with other fragments is postulated to lead to the formation of commonly observed complex organic molecules (COMs) as glycolaldehyde, ethanol, ethyl glycol, and dimethyl ether. Determination of the $\text{CH}_3\text{O}/\text{CH}_2\text{OH}$ ratio should enable to differentiate between gas and grain surface formation scenario for the radicals and therefore for the COMs that form from them. Interestingly, despite the recent first laboratory detection of CH_2OH pure rotational spectrum and while this isomer is the most thermodynamically stable, only CH_3O has so far been detected in the ISM. A plausible explanation to this lack of interstellar detection is the non-observation in the laboratory of the most intense transitions at low temperature.

We have re-investigated the pure rotational spectrum of CH_2OH at room temperature in the millimeter-wave domain, using a frequency modulation submillimeter spectrometer, with emphasized searches for the fundamental b -type transitions and those intense at low temperature. The radical was produced by H abstraction from CH_3OH using F atoms produced by a microwave discharge. A combined fit of the infrared and millimeter-wave lines from the literature and our new measurements using a rigid-rotor Hamiltonian yielded a large improvement in the spectroscopic parameters values allowing now confident searches of CH_2OH in cold interstellar environments.