Q15a Laboratory Measurement of Millimeter-wave Transitions of $^{13}CH_2DOH$ for Astronomical Use

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Methanol (CH_3OH) is an abundant interstellar species and is known to play an important role in formation of various interstellar complex-organic molecules as a mother species. As a monodeuterated methanol, CH_2DOH is one of the most abundant isotopologues of CH_3OH and it is often used to study the formation process of CH_3OH. However, the abundance of CH_2DOH needs to be carefully evaluated, because its rotational lines are often optically thick. Observations of the ^{13}C substituted species, $^{13}CH_2DOH$, are the best way to overcome this situation. In this study, the rotational transitions of $^{13}CH_2DOH$ have been measured in the millimeter-wave region from 216 GHz to 264 GHz with an emission-type millimeter and submillimeter-wave spectrometer by using a deuterium and ^{13}C enriched sample for the first time, where the accuracy of the measured frequencies is a few kHz. The relative line intensities of $^{13}CH_2DOH$ are also measured within the error of 10% or less in most of the frequency range. In total, 115 lines are assigned for the three torsional sub-states, e_0, e_1 and o_1. Effective molecular constants are tentatively derived with the aid of SPFIT program distributed by JPL. These results can be used to detect the $^{13}CH_2DOH$ lines in space, and its detection will accelerate the studies of the deuterium fractionation of CH_3OH in various sources through accurate determination of the CH_2DOH abundance.