COMPUTATIONAL STUDY AND LABORATORY SPECTROSCOPY OF PREBIOTIC MOLECULES PRODUCED BY O(^{1}D) INSERTION REACTIONS

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Methanediol ($HOCH_2OH$), methoxymethanol (CH_3OCH_2OH), and aminomethanol ($HOCH_2NH_2$) are unstable organic reaction intermediates that are predicted by astrochemical models to be present in detectable quantities in the interstellar medium. Their astronomical investigation has been precluded by a lack of gas-phase spectroscopic information. In order to obtain such spectra, on-the-fly O(^{1}D) insertion reactions in a supersonic expansion have been proposed as an efficient synthetic route to form these molecules. *Ab initio* calculations have been performed to determine the spectroscopic constants of these species so that the rotational spectra can be predicted as a guide for laboratory studies. Additionally, a multipass millimeter and submillimeter spectrometer has been coupled with a photolysis fast-mixing source to enable spectroscopic studies of the target molecules. We will report on the results of the computational studies, the instrument and source design, and experimental progress toward obtaining the rotational spectra of methanediol, methoxymethanol, and aminomethanol.