AN EXHAUSTIVE ISOTOPIC STUDY OF THE ABUNDANT ASTRONOMICAL MOLECULE CYCLOPROPENYLIDENE, c-C_3H_2

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Cyclopropenylidene, c-C_3H_2, is the most widely distributed ring in our galaxy; it has been detected in more than 50 astronomical sources, and its isotopic species c-C_3HD has been observed towards several dense cores in cold dark clouds. Because of the high observed abundance and large deuterium fractionation for this small hydrocarbon ring, other isotopic species of c-C_3H_2 may be good candidates for astronomical detection. For these reasons, an exhaustive isotopic study of c-C_3H_2 has now been undertaken in which rotational spectra of c-C_3D_2, c-C_3HD, and the carbon–13 isotopic species of c-C_3HD and c-C_3H_2 have been detected in the centimeter-wave band by Fourier transform microwave (FTM) spectroscopy between 10 and 40 GHz. For c-C_3D_2, millimeter- and submillimeter-wave spectra were subsequently measured between 140 and 400 GHz. Rotational and centrifugal distortion constants derived either from previous measurements or those predicted from theory are compared with the precise constants determined here.