LABORATORY AND ASTRONOMICAL DETECTION OF CYANIC ACID, HOCN

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Isocyanic acid (HNCO) was among the first interstellar molecules identified by radio astronomical observations[a] and has since been found in at least sixty Galactic sources[b], and in three external galaxies[c]. It is the most stable of four isomers with this elemental composition, and has been extensively studied from the microwave to the IR region, as has the higher lying isomer fulminic acid, HCNO[d]. Here we report the recent laboratory and astronomical detection of the second-most stable isomer, cyanic acid HOCN, which is only 21 kcal/mol or 0.9 eV higher in energy than HNCO. In the laboratory, 45 a-type transitions were measured in the frequency range 20-360 GHz up to $J = 17$ and $K_a = 4$ with a Fourier Transform Microwave spectrometer (FTM) or a free-space mm-wave absorption spectrometer. HOCN was produced in a discharge through water and cyanogen. The identification was confirmed by observing lines of DOCN at the expected isotopic shift, and by resolving the ^{14}N hyperfine structure. Based on this laboratory study, we have now detected HOCN towards SgrB2(M) in 3-mm and 2-mm survey data[e] via four a-type transitions in the $K_a = 0$ and three in the $K_a = 1$ ladder.

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