HIGH-RESOLUTION MICROWAVE SPECTROSCOPY OF IMINOSILICON, HNSI

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By means of Fourier transform microwave spectroscopy of a supersonic beam, the fundamental rotational transition of isotopic and vibrationally-excited iminosilicon HNSi has been detected. In addition to seven isotopic species, vibrational satellite transitions from more than 30 vibrationally-excited states, including the three fundamental modes, have been detected. Those from v_2 are particularly intense, enabling detection of transitions from as high as $(0, 22^0, 0)$ (i.e. $\sim$10,000 cm^{-1} above ground). At high spectral resolution, well-resolved nitrogen quadrupole structure has been observed in nearly every transition. Excitation of v_1 or v_3 changes eQq(N) little, but eQq(N) systematically decreases with increasing excitation of the v_2 bend, from a value of 0.376(5) MHz for $(0, 0^0, 0)$ to -2.249(5) MHz for $(0, 20^0, 0)$. With the large amount of new data in hand, it has been possible to determine more precise vibration-rotation constants and an improved semi-empirical structure for this triatomic molecule. An unsuccessful search for HSiN, a highly polar isomer calculated to lie nearly 3 eV above HNSi, is also reported.