ROTATIONAL SPECTROSCOPY AND MOLECULAR PROPERTIES OF TITANIUM DIOXIDE, TiO_2

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Titanium is one of the more abundant transition metals in space, and its dioxide is thought to be an important constituent of grains generated in the vicinity of oxygen-rich stars. Therefore, we have investigated the rotational spectrum of TiO_2 by laser-ablation molecular-beam Fourier transform microwave (LAMB-FTMW) spectroscopy between 7 and 42 GHz. Five isotopic species containing $^{46-50}$Ti were studied in natural isotopic composition and two, $^{48}Ti^{16}O^{18}O$ and $^{48}Ti^{18}O_2$ were obtained through the use of $^{18}O_2$. Despite the comparatively large rotational constants and the absence of half of the rotational levels for all but the mixed $^{16}O^{18}O$ isotopic species because of spin-statistics, up to 13 rotational transitions with energies up to almost 40 cm^{-1} could be recorded, permitting rotational and quartic centrifugal distortion parameters to be determined along with hyperfine structure parameters for the species containing ^{47}Ti or ^{49}Ti. The derived molecular structure and the harmonic force field as well as the hyperfine structure parameters will be compared with those of related molecules. Preliminary results of a search toward several oxygen-rich late-type stars carried out with the IRAM 30 m telescope will also be presented.