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Title:Millimeter-wave spectroscopy of titanium dioxide, TiO₂

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Abstract: The millimeter-wave rotational spectrum of TiO₂ in its ground vibrational state has been recorded in the frequency range from 248 to 345 GHz using the Cologne Supersonic Jet Spectrometer for Terahertz Applications (SuJeSTA). Forty-two b-type rotational transitions of the main isotopologue ⁴⁸TiO₂ and five transitions of ⁴⁶TiO₂ in natural abundance have been measured up to J = 22 and Ka = 8 which corresponds to excitation temperatures of 170 K. TiO₂ was formed by laser ablation and adiabatically cooled in a supersonic jet of helium to rotational temperatures of 20 K. The new transitions have been analyzed together with previously reported data obtained from Fourier-transform microwave spectroscopy in the frequency range from 7 to 42 GHz. The improved and extended set of spectroscopic parameters provides accurate transition frequencies for future astronomical searches in the millimeter-wave region.