MILLIMETERWAVE AND FOURIER-TRANSFORM EMISSION SPECTRA OF THE BiS RADICAL

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The millimeterwave rotational spectrum of BiS in its $X^2Π_{1/2}$ state was observed in the frequency range of 150-300 GHz. BiS was produced in a high-temperature oven by a discharge in a mixture of Bi vapor and CS$_2$. A White-type multipath cell was used to enhance the absorption pathlength. Near infrared bands of the transition were measured by Fourier-transform emission spectroscopy in the 6400-7400 cm$^{-1}$ region, where BiS was produced by reaction of bismuth and sulfur vapor and excited by collisional energy transfer from the metastable $a^1Δ_p$ electronic state of O$_2$. A simultaneous analysis of millimeterwave and FT data was carried out to give rotational, fine and hyperfine constants for the $X^2Π_{1/2}$ and $X^2Π_{3/2}$ states. Ninety seven rotational $ΔJ = 1$ features from $J' = 23.5$ to 41.5 and 545 NIR features representing assignments of a wide range of $J'$s were included in the fit. The hyperfine parameters are consistent with those of BiO with slightly less unpaired electron density in the antibonding $π$ orbital on the Bi atom. Examples of the spectra will be shown. The fitting procedure with SPCAT$^a$ and the resulting parameters will be discussed.
