LASER SPECTROSCOPY OF THE $\tilde{X}^2\Pi_g$, $\tilde{A}^2\Pi_u$ AND $\tilde{B}^2\Sigma_u^+$ STATES OF BS_2: RENNER-TELLER, SPIN-ORBIT and K-RESONANCE EFFECTS

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The lowest-lying vibronic levels of the $\tilde{X}$, $\tilde{A}$, and $\tilde{B}$ states of BS_2 have been investigated at high resolution using a combination of room-temperature absorption and supersonic jet data. In both cases, the BS_2 radical was prepared in an electric discharge using a precursor gas mixture of BCl_3, CS_2, and either helium or argon. Extensive absorption spectra were obtained for the 0_0^0 and 2_1^1 bands of the $\tilde{A}^2\Pi_u - \tilde{X}^2\Pi_g$ electronic transition in the visible using a mutipass discharge cell and a scanning ring dye laser. The $\tilde{A} - \tilde{X}$ and $\tilde{B} - \tilde{X}$ 2_1^1 bands of jet-cooled BS_2 were also studied with laser-induced fluorescence techniques. By fitting the 0_0^0 bands of both electronic transitions simultaneously, we were able to precisely determine the spin-orbit splittings in both the $\tilde{A}$ and $\tilde{X}$ states. The 2_1^1 bands were fitted in a merged analysis in order to determine the relative separations of the vibronic components of the ground and first excited state bending levels as accurately as possible. Due to a large spin-orbit splitting and small Renner-Teller interaction, the $\tilde{A}$ state bending level shows small but definite K-resonance effects, which were fitted using a full matrix for the four components of $v_2 = 1$. The resulting parameters were used along with previously published data to refine the Renner-Teller analyses in both the $\tilde{A}^2\Pi_u$ and $\tilde{X}^2\Pi_g$ electronic states.