

## OBSERVATION AND ANALYSIS OF THE $2\nu_3$ BAND OF $^{32}\text{S}^{16}\text{O}_3$

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We are engaged in a comprehensive investigation of the fundamental and low lying combination and overtone bands of the parent  $^{32}\text{S}^{16}\text{O}_3$  as well as the  $^{34}\text{S}^{16}\text{O}_3$ ,  $^{32}\text{S}^{18}\text{O}_3$ , and  $^{34}\text{S}^{18}\text{O}_3$  isotopic variants of sulfur trioxide. CARS spectroscopy of the  $\nu_1$  Raman active bands has been performed at Oregon State University and high resolution infrared absorption spectroscopy of room temperature static cell samples has been performed at PNNL using a Bruker IFS 120 HR Fourier transform spectrometer. Results for the absorption spectrum of the  $2\nu_3$  band of  $^{32}\text{S}^{16}\text{O}_3$ , recorded at a resolution of  $0.0025\text{ cm}^{-1}$ , will be presented. The overtone of the  $\nu_3$  fundamental  $[(e')^2 = A'_1 + E']$  is centered at  $2777.87139(5)\text{ cm}^{-1}$  with  $B' = 0.3462802(2)\text{ cm}^{-1}$  and  $B'' = 0.34854336(4)\text{ cm}^{-1}$ . Assignment and fitting of the perpendicular band shows that there is an internal perturbation that arises from a  $\Delta k = \pm 2$ ,  $\Delta l = \pm 2$  coupling of the  $l = 0$  and  $l = \pm 2$  components. A level crossing is evident with the  $l = 2$ ,  $k = 11$  levels pushed to higher energy and the  $l = 2$ ,  $k = 14$  levels pushed to lower energy, for example. We have determined that the band center of the perturbing dark state is approximately  $11\text{ cm}^{-1}$  below that of the bright state. The Hamiltonian including perturbing terms and fit constants will be presented. In addition,  $\nu_2$ ,  $\nu_3$ , and  $\nu_4$  have been measured and analyzed to reveal new details such as the splitting of the  $K = 2$  and  $K = 3$  levels.