# MASS-INDEPENDENT ROTATIONAL AND DEPERTURBATION ANALYSIS OF THE [15.30]1 AND [14.26]$0^+$ ELECTRONIC STATES OF TUNGSTEN SULFIDE (WS)

KRISTIN N BALES, JACK C HARMS, JAMES J O'BRIEN, *Chemistry and Biochemistry, University of Missouri, St. Louis, MO, USA*; LEAH C O'BRIEN, *Department of Chemistry, Southern Illinois University, Edwardsville, IL, USA*.

The complex electronic structure of transition metal diatomic molecules, such as tungsten monosulfide (WS), makes them intriguing targets for high level spectroscopic analysis. A plethora of electrons and accessible valence orbitals make WS a difficult molecule to model computationally due to the large number of possible electronic interactions. The (0,0) and (1,0) vibrational bands of the [15.30]1 – X $^3\Sigma^-(0^+)$ transition of WS were recorded in absorption at Doppler-limited resolution using intracavity laser spectroscopy integrated with a Fourier-transform spectrometer used for detection (ILS-FTS). The target WS molecules were produced in the plasma discharge of a tungsten-lined copper hollow cathode, using a gas mixture of approximately 70% Ar and 30% $H_2$, with a trace amount of $CS_2$, giving a reaction chamber pressure of about 1 torr total. Within each spectrum, evidence of heterogeneous mass- and J-dependent perturbations were observed across all four abundant isotopologues: $^{182}W^{32}S$, $^{183}W^{32}S$, $^{184}W^{32}S$, and $^{186}W^{32}S$. The perturbations observed in the (0,0) and (1,0) bands were attributed to interactions with lines in the v=2 and v=3 vibrational levels of the [14.26]$0^+$ state of WS. Rotational and deperturbation analyses incorporated a mass-independent Dunham model built into PGOPHER to fit lines from the two [15.30]1 transition bands, as well as line positions from several bands of the [14.26]$0^+$ – X $^3\Sigma^-(0^+)$ transition previously analyzed by our group (J.C. Harms et al., J. Mol. Spec. 2020 (374), 111378). The results of this analysis and comparison with previous computational work (J. Zhang et al., J. Quant. Spectrosc. Radiat. Transfer. 2020 (256), 107314) will be presented.