IDENTIFICATION OF THE FIRST ROTATIONALLY RESOLVED ELECTRONIC TRANSITIONS OF TUNGSTEN SULFIDE OBSERVED USING INTRACAVITY LASER SPECTROSCOPY

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Six bands have been recorded at high resolution in absorption in the visible using Intracavity Laser Spectroscopy (ILS). The bands were observed in the current-regulated RF discharge resulting when 0.30 A was applied to a W-lined Cu hollow cathode, using approximately 300 mTorr of an Ar/$\mathrm{H_2}$ sputter gas mixture with a trace amount of either $\mathrm{CS_2}$ or $\mathrm{SF_6}$. The hollow cathode was located within the resonator cavity of a DCM dye laser operating over the 14,500-16,500 $\mathrm{cm^{-1}}$range, utilizing effective pathlengths of 0.2-1.0 km with the ILS method. The six observed bands are grouped currently into two vibrational progressions. The (0,0) bands have been identified by negligible W-isotope shifts, and have red-degraded bandheads near 15,050 $\mathrm{cm^{-1}}$and 15,304 $\mathrm{cm^{-1}}$. Both series have a vibrational separation of approximately 525 $\mathrm{cm^{-1}}$, and preliminary rotational constants of 0.14 $\mathrm{cm^{-1}}$. These values are consistent with the predicted spectroscopic constants for WS [Sevy *et al., J. Phys. Chem. A*, **121**, 9446 (2017)], which has not been previously studied experimentally at high resolution. The inclusion of $\mathrm{H_2}$ in the sputter gas mixture results in a roughly 10-fold increase in transition intensity. However, this increase in transition intensity is also observed if $\mathrm{D_2}$ is added to the sputter gas mixture in place of $\mathrm{H_2}$, with no observable rotational or vibrational shift for any of the observed bands. The transitions will be rotationally analyzed and fit using PGOPHER. The results of this analysis will be presented.