ROTATIONAL ANALYSIS OF HIGH RESOLUTION LASER EXCITATION AND DISPERSED FLUORESCENCE SPECTRA FROM THE $B^1\Sigma^+ - A^1\Pi$, $B^1\Sigma^+ - X^1\Sigma^+$, AND $B^1\Sigma^+ - a^3\Pi_1$ SYSTEMS OF MgS.

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Magnesium Sulfide (MgS) is an astrophysically interesting molecule. Its solid form is the main component of the mineral niningerite (found in enstatite chondrite meteorites) and the MgS component of solid dust grains has generally been agreed upon as the carrier of the 30 μm feature seen in the emission spectra of some carbon-rich stars[a]; however, investigations of the visible spectrum of gas phase MgS remain relatively sparse in the literature.

The first analysis of a rotationally-resolved spectrum of MgS in the gas phase was undertaken by Marcano and Barrow in 1970[b], who investigated the $B^1\Sigma^+ - X^1\Sigma^+$ system in absorption. Our group at UNB previously reported the first experimental observation and rotational analysis of the low-lying $A^2\Pi$ state of MgS at $4531.94\ \mathrm{cm}^{-1}$ from a series of laser-induced dispersed fluorescence spectra taken using a grating spectrometer. Since then we have extended this work by recording a series of dispersed fluorescence spectra of the $B^1\Sigma^+ - A^1\Pi$ and $B^1\Sigma^+ - X^1\Sigma^+$ systems at higher resolution using a BOMEM DA3 Fourier transform interferometer. The weak $B^1\Sigma^+ - a^3\Pi_1$ transition was also observed. We present here our extended analyses of the $B^1\Sigma^+ - A^1\Pi$ and $B^1\Sigma^+ - X^1\Sigma^+$ systems, as well as the first analysis of the $B^1\Sigma^+ - a^3\Pi_1$ system in MgS.

[a]Volk, Kevin; Sloan, G. C.; Kraemer, Kathleen E. (2020). The 21 μm and 30 μm emission features in carbon-rich objects. Astrophysics and Space Science, Volume 365 (Issue 5), article id.88. DOI: 10.1007/s10509-020-03798-2.

[b]Marcano, M; Barrow, R. F. (1970). Rotational Analysis of Bands of the $B^1\Sigma^+ - X^1\Sigma^+$ system of gaseous MgS. Transactions of the Faraday Society, Volume 66, pages 2936-2938. DOI: 10.1039/TF9706602936.