

SPECTROSCOPY OF THE $X^1\Sigma^+$, $A^1\Pi$ and $B^1\Sigma^+$ ELECTRONIC STATES OF MgS

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The spectra of some astrophysical sources contain signatures from molecules containing magnesium or sulphur atoms. Therefore, we have extended previous studies of the diatomic molecule MgS, which is a possible candidate for astrophysical detection. Microwave spectra of $X^1\Sigma^+$, the ground electronic state, were reported in 1989^a and 1997^b, and the $B^1\Sigma^+ - X^1\Sigma^+$ electronic absorption spectrum in the blue was last studied in 1970^c. We have investigated the $B^1\Sigma^+ - X^1\Sigma^+$ 0-0 spectrum of MgS at high resolution under jet-cooled conditions in a laser-ablation molecular source, and have obtained laser-induced fluorescence spectra from four isotopologues. Dispersed fluorescence from this source identified the low-lying $A^1\Pi$ state near 4520 cm^{-1} . We also created MgS in a Broida oven, with the help of a stream of activated nitrogen, and took rotationally resolved dispersed fluorescence spectra of the $B^1\Sigma^+ - A^1\Pi$ transition with a grating spectrometer by laser excitation of individual rotational levels of the $B^1\Sigma^+$ state via the $B^1\Sigma^+ - X^1\Sigma^+$ transition. These spectra provide a first observation and analysis of the $A^1\Pi$ state.

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