

LASER-INDUCED FLUORESCENCE (LIF) OF JET-COOLED SmO

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The chemi-ionization reactions of atomic lanthanides $M + O \rightarrow MO^+ + e^-$ are currently being investigated as a method to artificially increase the localized electron density in the ionosphere for uniform radio wave propagation. Recent experiments involving the release of atomic samarium (Sm) into the upper atmosphere have resulted in the production of a cloud with blue and red emissions[1]. Spectroscopic characterization of both SmO and its cation SmO⁺ is required to accurately determine the fraction of SmO⁺ present in the release cloud. While the low-lying states of SmO have been previously spectroscopically characterized, the analysis was hindered due to the production of SmO under high temperature conditions[2,3]. In this experiment, SmO was jet-cooled to 70K and laser-induced fluorescence (LIF) spectra were obtained over the range from 15,000-16,000 cm⁻¹. Dispersed laser-induced fluorescence (DLIF) spectra were also obtained for vibrational characterization of the ground and low-lying states. Fluorescence lifetime measurements have been used to determine Einstein A coefficients. Data and analysis of ground and low-lying excited states of SmO will be presented.

[1] Ard, S.G. et al. J. Chem. Phys. 2015, 143, 204303.

[2] Hannigan, M. C. J. Mol. Spec. 1983, 99, 235-238.

[3] Linton, C. et al. J. Mol. Spec. 1987, 126, 370-392.