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**Molecular Spectroscopy of TiO in Laser-Induced Plasma**[1]
ALEXANDER C. WOODS, CHRISTIAN G. PARIGGER, University of Tennessee Space Institute — Potential energy curves can be calculated for many diatomic molecules due to the symmetries and availability of experimental data for the spectral transitions of diatomic molecules. With accurate potential energy curves for diatomic molecules, line strengths can be determined for allowed spectral transitions. Combined with parameters such as temperature and resolution, line strengths allow us to create the molecular spectra. This investigation explores the fitting of computed spectra for selected titanium monoxide (TiO) molecular transitions to measured spectra collected at various times following the generation of laser-induced plasma. Using gated detection, spectral data is gathered during laser ablation of a titanium sample at rest in laboratory air. A Nelder-Mead fitting routine is applied to infer the temperature of the spectral transitions in the plasma. The result is a temperature versus time profile of the transitions of the TiO molecule along the plume. The error associated with each inference is determined by randomly adjusting the spectral baseline, as the measured spectrum is repeatedly fit. Atomic lines, which dominate the early spectra of laser-induced plasma, are also addressed.

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