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Micro-plasma Parameter Inferences Utilizing Titanium Spectral Transitions[1] ALEXANDER WOODS, CHRISTIAN PARIGGER, University of Tennessee Space Institute — The availability of experimentally obtained data of TiO spectral transitions has enabled the computational modeling of molecular potentials to be used in a Rydberg-Klein-Rees method for the development of TiO line strengths for selected molecular transitions. These line strengths provide information necessary to generate computed spectra for diatomic molecules, given various input parameters. The value of such a parameter as temperature can be inferred for an experimentally obtained spectrum by fitting with computed spectra of varying parameters. In this effort, a Nelder-Mead algorithm is utilized as a fitting routine in the analysis of TiO spectra collected from laser-induced plasma. In measurements, a Nd:YAG laser is the excitation source, as a titanium sample is repeatedly exposed to nanosecond pulsed radiation. Gated detection provides time-resolved results used to infer temperature as a function of time following laser-induced breakdown. A local minimum can be seen in the temperature versus time profile when imaging certain areas of the plasma, as a slight increase in inferred temperature occurs at later collection times. Characteristic of combustion, this phenomenon is investigated by analyzing the effect of signal to noise ratios on temperature inferences. This is accomplished utilizing Monte Carlo type simulations providing random noise to the measured spectra and adjusting the baseline prior to fitting. Detectable at early as well as later delay times, atomic Ti structure is also addressed.

[1]Center for Laser Applications

Alexander Woods
Univ of Tennessee Space Inst

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