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LASER OPTOGALVANIC SPECTROSCOPY IN MICROGRAVITY COMBUSTION

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Abstract

Laser excited optogalvanic transitions have been excited in the near ultraviolet and visible for calibration and interpretation of free radical spectra associated with microgravity combustion processes.

(26 words)

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Wavelength calibration of tunable lasers is very important in experimental laser spectroscopy. Iodine can be used for precise laser calibration in the 500-675 nm region. However, there is a paucity of suitable species for such calibration in the blue and near ultraviolet regions of the electromagnetic spectrum. The laser excited optogalvanic effect provides a good solution for wavelength calibration inadequacies in the visible and near UV regions for elucidation of microgravity combustion and atmospheric processes involving free radicals.[1]

A specially designed Laser Galvatron (Hamamatsu L2783-26ANE-FE) was used for excitation of the optogalvanic transitions. One of the main differences between a Laser Galvatron and the conventional hollow-cathode lamp is that both the anode and cathode of the Galvatron have 5 mm holes that are aligned in series so that the laser beam can go through the discharge zone without hitting the electrodes. Otherwise, the impinging laser beam would destroy the cathode surface coating and also

introduce spectral lines of impurities in the optogalvanic spectrum. Typically, a 200 V (DC) high voltage was connected to the anode through a ballast resistor of 30 kohms and the discharge current was set at 1.2 mA. We have investigated the emission spectrum of the Laser Galvatron using an Optical Multichannel Analyzer (EG & G OMA4) system coupled to a 0.275 M spectrograph equipped with a 1800 grooves/mm grating. Laser optogalvanic transitions have been recorded in the near UV and visible with a nominal spectral resolution of 0.1 nm and utilized for calibration and interpretation of free radical spectra of significance for elucidation of microgravity combustion and atmospheric photochemical processes.

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Reference

1. "Laser optogalvanic wavelength calibration with a commercial hollow cathode iron-neon discharge lamp," X. Zhu, A.H. Nur, and P. Misra, *J. Quant. Spectrosc. Radiat. Transfer* **52,** 167-177 (1994).