FORTHCOMING PAPERS

Two-Color TEA CO_2 Laser Oscillation on the Lines of Regular and Hot Bands

V. V. Churakov, V. O. Petukhov, S. Ya. Tochitsky (USSR)

Based on the separation of two orthogonally-polarized waves simultaneous, efficient lasing on an arbitrary pair of lines of regular 00^01—$10^00(02^00)$ and hot 01^11—11^10 bands in the TEA CO_2 laser has been obtained. The possibility of controlling energy, spectral, and temporal radiation parameters of the two-wavelength regime over a wide range is shown experimentally.

Endoergic and Resonant Charge Transfer Excitation in He-Cu Discharge

P. Metzei, K. Rózsa, M. Jánossy. P. Apai (Hungary)

The intensity of Cu-II lines with upper level energies near and above those of the He ion was measured as a function of He pressure in a Cu hollow cathode tube where, for low pressure discharge, room was left for the negative glow to expand above the cathode. The maximum intensity of the Cu-II 493.1 nm line was found in the low-voltage, high-pressure hollow-cathode discharge region in accordance with a resonant charge transfer excitation process. Enhancement of the intensity of the Cu-II 436.5 nm and 417.9 nm lines was observed at low-pressures in the cathode glow. Excitation of these lines is attributed to endoergic charge transfer collisions between He ions accelerated by the 2 kV tube voltage and ground-state Cu atoms. The cross-section for this reaction exciting the 436.5 nm line was estimated to be of the order of 10^{-17} cm^2.

Thermal-Wave Detection and Characterisation of Sub-Surface Defects

P. M. Patel, D. P. Almond, H. Reiter (UK)

Results of the analysis of air-gap and thermal-contact resistance defects are presented. The analysis is illustrated by model predictions of the influence of such defects in a number of important coated and uncoated materials. Experimental results of defects in steel and aluminium coated steel samples are presented and compared with theory. These results show the importance of the lateral extent of the defect and the presence of contact points within the defect.

Analysis of Liquid Surface Films by Pulsed Laser Photoacoustic Spectroscopy

M. W. Sigrist, Z. H. Chen (Switzerland)

The photoacoustic generation of plane acoustic waves in strongly absorbing or opaque liquids by pulsed laser radiation is discussed both experimentally and theoretically. The regimes of a confined and a free surface of the liquid are considered. The model which takes the temporal shape of the laser pulses applied in the experiments into account, implies that spectroscopic studies are feasible with direct photoacoustic generation and detection also for opaque liquids. The experiments are performed with a tunable hybrid CO_2 Laser and piezoelectric detection. For the first time liquid/liquid interfaces are studied by this technique. We demonstrate that the presence of an absorbing liquid film with a thickness of $> 1\mu m$ on the surface of another liquid amplifies the acoustic signal which is detected in the bottom liquid. The enhancement depends on the thickness and the optical and thermal properties of the film medium. The surface layer can be analyzed on the basis of the photoacoustic spectrum. It is also shown that this noncontact method is surface-film selective and should thus prove useful for pollution analysis of liquid surfaces.

Operational Characteristics of a MAGPIE Coaxial CO_2 Discharge System

V. A. Seguin, H. J. J. Seguin, C. E. Capjack, S. K. Nikumb (Canada)

The operational characteristics of a convectively cooled magnetically stabilized, photo-initiated, impulse-enhanced, electrically-excited (MAGPIE) coaxial discharge system are described. Terminal behavior is examined as a function of several parameters, such as gas flow, pulser ionization, and magnetic field strength. In-situ plasma potential measurements are also presented, which indicate that CO_2 attachment affects have considerable influence on the spatial electrical characteristics of the gas discharge.

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