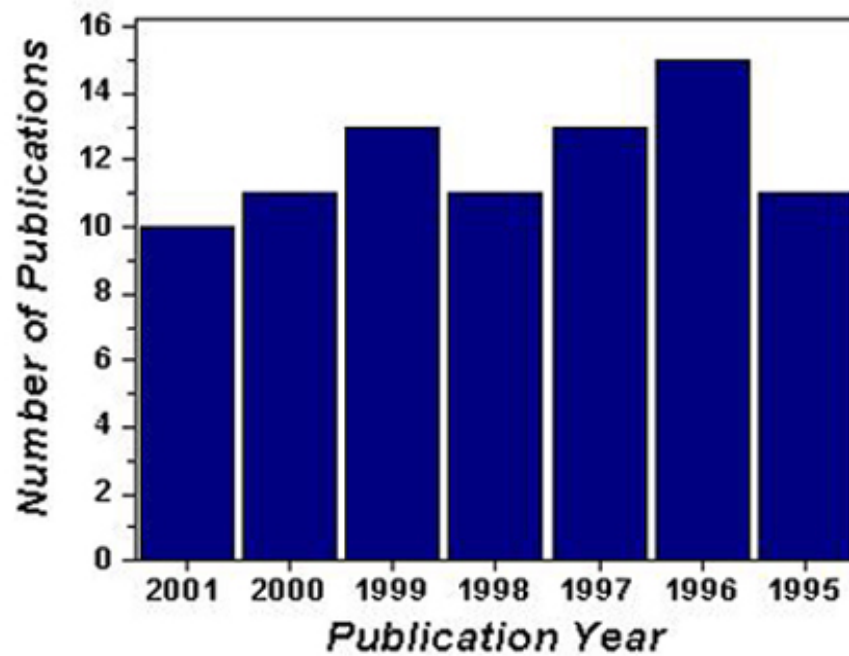


# International School of Photonics

## Publication List with Abstract

(2001-1995)



### **Bibliographic Information**

**Fiber optic pH sensor with dye-doped multilayer sol-gel coatings.** Lee, Thomas S.; Jose, Gin; Manju, C. M.; Joseph, Betty; John, M. Shelly; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.; Unnikrishnan, N. V. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Proc. SPIE-Int. Soc. Opt. Eng. (2001), 4417(Photonics 2000), 546-554

#### **Abstract**

No abstr. available.

### **Bibliographic Information**

**Chemical sensing with microbent optical fiber.** Thomas, Lee S.; George, Nibu A.; Sureshkumar, P.; Radhakrishnan, P.; Vallabhan, C. P. G.; Nampoori, V. P. N. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Optics Letters (2001), 26(20), 1541-1543.

#### **Abstract**

The authors propose and demonstrate the possibility of using a permanently microbent bare optical fiber for detecting chem. species. Two detection schemes, viz., a bright-field detection scheme (for the core modes), and a dark-field detection scheme (for the cladding modes) were employed to produce a fiber-optic sensor. The sensor described here is sensitive enough to detect concns. as low as nanomoles per L of a chem. species, with a dynamic range of >6 orders of magnitude.

### **Bibliographic Information**

**A sensitive fiber optic pH sensor using multiple sol-gel coatings.** Lee, S. Thomas; Gin, Jose; Nampoori, V. P. N.; Vallabhan, C. P. G.; Unnikrishnan, N. V.; Radhakrishnan, P. International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Opt. A: Pure Appl. Opt. (2001), 3(5), 355-359.

#### **Abstract**

The fabrication and characterization of a fiber optic pH sensor based on evanescent wave absorption is presented. The unclad portion of a multi-mode optical fiber is coated with a pH sensitive dye, which is immobilized by the sol-gel route. The sensitivity of the device increases when multiple sol-gel coatings were used as the sensing region. The dynamic range and the temporal response of the sensor were studied for two different dyes, bromocresol purple and bromocresol green. The performance of the device is evaluated in terms of the results obtained during actual measurements.

### **Bibliographic Information**

**Influence of laser irradiance and helium ambient on the expansion of laser-produced carbon plasma.** Harilal, S. S.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Institut fur Experimentalphysik V, Ruhr Universitat Bochum, Bochum, Germany. Proc. SPIE-Int. Soc. Opt. Eng. (2001), 4424(Laser Interaction with Matter), 520-523.

## **Abstract**

The emission features of laser ablated carbon plasma plume generated in helium ambient have been investigated with time resolved plasma diagnostic technique. At lower irradiance levels only a slowly propagating C<sub>2</sub> component is seen. At higher irradiance levels, emission from C<sub>2</sub> shows a twin peak distribution in time. The present results also show that the helium ambient pressure and laser irradiance has opposite effects on the time of flight profiles of C<sub>2</sub> species. A simple adiabatic expansion model appears to provide a good description of the plume range and this may provide useful for scaling deposition expts. in terms of pressure and laser irradiance.

## **Bibliographic Information**

**Use of an open photoacoustic cell for the thermal characterisation of liquid crystals.** George, N. A.; Vallabhan, C. P. G.; Nampoori, V. P. N.; George, A. K.; Radhakrishnan, P. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Appl. Phys. B: Lasers Opt. (2001), 73(2), 145-149.

## **Abstract**

The authors describe the use of an open cell photoacoustic configuration for the evaluation of the thermal effusivity of liq. crystals. The feasibility, precision and reliability of the method are initially established by measuring the thermal effusivities of water and glycerol, for which the effusivity values are known accurately. In order to demonstrate the use of the present method in the thermal characterization of liq. crystals, we have measured the thermal effusivity values in various mesophases of 4-cyano-4'-octyloxybiphenyl (8OCB) and 4-cyano-4'-heptyloxybiphenyl (7OCB) liq. crystals using a variable temp. open photoacoustic cell. A comparison of the measured values for the two liq. crystals shows that the thermal effusivities of 7OCB in the nematic and isotropic phases are slightly less than those of 8OCB in the corresponding phases.

## **Bibliographic Information**

**Open-cell photoacoustic investigation of the thermal effusivity of liquid crystals.** George, Nibu A.; Vallabhan, C. P. G.; Nampoori, V. P. N.; George, A. K.; Radhakrishnan, P. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Opt. Eng. (Bellingham, WA, U. S.) (2001), 40(7), 1343-1347.

## **Abstract**

The authors report the use of an open photoacoustic cell configuration for the evaluation of thermal effusivity of liq. crystals. Initially, the method is calibrated using H<sub>2</sub>O and glycerol as transparent liq. samples, and the role of thermal cond. of these liqs. on the photoacoustic signal amplitude is discussed. To demonstrate the application of the present method for the evaluation of thermal effusivity of liq. crystals, the authors used certain multicomponent nematic liq. crystal mixts., BL 001, BL 002, BL 032, and BL 035. Each of these liq. crystal mixts. contains 4 to 9 components and are primarily based on the cyanobiphenyl structure. The measured values of thermal effusivity of BL 001 and BL 002 are almost the same, but differ from those of BL 032 and BL 035, which implies a difference in compn. of the latter 2 from the former 2 mixts.

## **Bibliographic Information**

**Nonlinear absorption and optical limiting in solutions of some rare earth substituted phthalocyanines.** Unnikrishnan, K. P.; Thomas, Jayan; Paul, Binoy; Kurian, Achamma; Gopinath, Pramod; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Nonlinear Opt. Phys. Mater. (2001), 10(1), 113-121.

## Abstract

Effective nonlinear absorption coeff.,  $\alpha_{\text{eff}}$ , of solns. of some rare earth substituted phthalocyanines (viz: Sm(Pc)<sub>2</sub>, Eu(Pc)<sub>2</sub> and LaPc) was measured using open aperture Z-scan technique under nanosecond pulse excitation at 532 nm. The effect of nonlinear absorption on optical limiting in these samples was also studied. Both nonlinear absorption and optical limiting phenomena in these samples are attributed to sequential 2-photon absorption (STPA) process.

## Bibliographic Information

**Optical absorption and emission spectral studies of phthalocyanine molecules in DMF.** Kumar, G. A.; Thomas, J.; Unnikrishnan, N. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Solid State Electronics Division, International School of Photonics, Cochin University of Science and Technology, Kochi, India. J. Porphyrins Phthalocyanines (2001), 5(5), 456-459.

## Abstract

Optical absorption and emission spectral studies of various phthalocyanine (Pc) mols. in DMF solvent are reported. Measurements were done for free base, Eu, Fe, Mn, Sm, Cu, Zn, Nd and La Pc-s. The principal optical transitions viz B and Q are identified and some of the important spectral parameters such as molar absorptivity ( $\epsilon$ ), absorption cross section ( $\sigma_a$ ), dipole strength (q) and oscillator strength (f) are evaluated for the prominent Q-band. The measured radiative parameters viz emission cross section ( $\sigma_e$ ), fluorescence bandwidth ( $\Delta\nu$ ) and optical gain (G) show wide variation among different systems. The results obtained are compared with other solid matrixes such as glass and polymer.

## Bibliographic Information

**Optical properties of phthalocyanine molecules in cyano acrylate polymer matrix.** Kumar, G. A.; Thomas, J.; Unnikrishnan, N. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Solid State Electronics Division, International School of Photonics, Cochin University of Science and Technology, Kochi, India. Mater. Res. Bull. (2001), 36(1-2), 1-8.

## Abstract

Optical absorption and emission spectral studies of various phthalocyanine mols., viz., LaPc, NdPc, SmPc, EuPc, CuPc and ZnPc in a polymer matrix of cyano acrylate are reported for the 1st time. All the absorption spectra show an intense B band (Soret) in the UV region followed by a weaker Q band in the visible region. The positions of the Q and B bands have dependence on the metallic substitution. Values of the important spectral parameters, viz., molar absorptivity ( $\epsilon$ ), oscillator strength (f), radiative transition rate and decay time of the excited singlet state are also presented and compared with other solid matrixes. The recorded fluorescence spectrum shows two broad emission bands in the case of NdPc, whereas for ZnPc only a very weak band is obsd. The absence of emission bands for the other metalated phthalocyanines is attributed to increased spin orbit interaction and intersystem crossing.

## Bibliographic Information

**Photoacoustic evaluation of the thermal effusivity in the isotropic phase of certain comb-shaped polymers.** George, Nibu A.; Vallabhan, C. P. G.; Nampoori, V. P. N.; George, A. K.; Radhakrishnan, P. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Journal of Physics: Condensed Matter (2001), 13(3), 365-371.

## Abstract

The thermal effusivity in the isotropic phase of comb-shaped liq. cryst. polymers was measured

using an open photoacoustic cell configuration. The comb polymers have siloxane and acrylate backbone and mesogenic groups in the side chain, i.e., poly(4-hexamethylenoxy-4'-3-Me butyloxy carbonyl-benzyl benzoate)siloxane (LCP1), poly(Me siloxy-4-cyano-4'-tetramethylenoxybiphenyl siloxane) (LCP93), and poly(4-cyano-4'-propyloxy-biphenyl)acrylate (LCP95). The backbone chain length and the side chain length have pronounced influence on the thermal effusivity of the liq. cryst. polymers.

### **Bibliographic Information**

**Use of photoacoustic effect for the detection of phase transitions in liquid crystal mixtures.** George, Nibu A.; Vallabhan, C. P. G.; Nampoori, V. P. N.; George, A. K.; Radhakrishnan, P. International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Phys. D: Appl. Phys. (2000), 33(24), 3228-3232.

#### **Abstract**

We report on a laser-induced photoacoustic study of the nematic-to-isotropic transition in certain com. nematic liq. crystal mixts., namely BL001, BL002, BL032, and BL035. A simple anal. of the exptl. data using the Rosenzweig-Gersho theory shows that the heat capacities of all these compds. exhibit a sharp peak as the temp. of the sample is varied across the transition region. Also, substantial differences in the photoacoustic signal amplitudes in nematic and isotropic phases were noticed for all the mixts. The increased light scattering property of the nematic phase may be the reason for the enhanced photoacoustic signal amplitude in this phase.

### **Bibliographic Information**

**Emission spectral studies of phthalocyanines in borate glass matrix.** Kumar, G. A.; Nampoori, V. P. N.; Vallabhan, C. P. G.; Jose, G.; Unnikrishnan, N. V. Solid State Electronics Division, International School of Photonics, Cochin University of Science and Technology, Kochi, India. J. Mater. Sci. Lett. (2000), 19(18), 1669-1672.

#### **Abstract**

The stimulated emission characteristics of metalated phthalocyanine mols. in borate glass matrix was investigated with the intention of using them as efficient active media for solid state lasers. All the glass samples were prepd. by the well known rapid quenching technique. Reagent grade boric acid (H<sub>3</sub>BO<sub>3</sub>) and doubly sublimed phthalocyanines (Pc-s) have been used as the starting materials for the prepn. of the glass samples. In all the fluorescence measurements the samples were excited at two wavelengths viz. 330 nm (corresponding to B band) and 700 nm (corresponding to Q band). However, the emission intensity, fluorescence bandwidth, decay time and emission cross section are found to vary. Even though the fluorescence intensity variation among the various Pc-s can be accounted for to some extent by considering the effect of spin-orbit interaction, electronegativity and ionic radius of the central metal atom, the exact reason for the arbitrariness is unknown. Emission cross sections of these newly developed glasses are found to be many times larger than other dye doped glass systems, which make them good candidates for application in a typical glass laser system.

### **Bibliographic Information**

**Numerical studies on bi-directionally coupled directly modulated semiconductor lasers.** Bindu, V.; Nandakumaran, V. M.. International School of Photonics, Cochin University of Science and Technology, Kerala, Cochin, India. Phys. Lett. A (2000), 277(6), 345-351.

#### **Abstract**

Results of a numerical study of synchronisation of two directly modulated semiconductor lasers,

using bi-directional coupling, are presented. The effect of stepwise increase in the coupling strength (C) on the synchronisation of the chaotic outputs of two such lasers is studied, with the help of parameter space plots, synchronisation error plots, phase diagrams and time series outputs. Numerical results indicate that as C increases, the system achieves synchronisation as well as stability together with an increase in the output power. The stability of the synchronised states is checked by applying a perturbation to the system after it becomes synchronised and then noting the time it takes to regain synchronisation. For lower values of C the system does not regain synchronisation. But, with higher values synchronisation is regained within a very short time.

### **Bibliographic Information**

**Numerical studies on bi-directionally coupled directly modulated semiconductor lasers.** Bindu, V.; Nandakumaran, V. M.. International School of Photonics, Cochin University of Science and Technology, Kerala, Cochin, India. Phys. Lett. A (2000), 277(6), 345-351.

### **Abstract**

Results of a numerical study of synchronisation of two directly modulated semiconductor lasers, using bi-directional coupling, are presented. The effect of stepwise increase in the coupling strength (C) on the synchronisation of the chaotic outputs of two such lasers is studied, with the help of parameter space plots, synchronisation error plots, phase diagrams and time series outputs. Numerical results indicate that as C increases, the system achieves synchronisation as well as stability together with an increase in the output power. The stability of the synchronised states is checked by applying a perturbation to the system after it becomes synchronised and then noting the time it takes to regain synchronisation. For lower values of C the system does not regain synchronisation. But, with higher values synchronisation is regained within a very short time.

### **Bibliographic Information**

**Dynamics of two coupled chaotic multimode Nd:YAG lasers with intracavity frequency doubling crystal.** Kuruvilla, Thomas; Nandakumaran, V. M.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Pramana (2000), 54(3), 393-402.

### **Abstract**

The effect of coupling 2 chaotic Nd:YAG lasers with intracavity KTP crystal for frequency doubling is numerically studied for the case of the laser operating in 3 longitudinal modes. The system goes from chaotic to periodic and then to steady state as the coupling const. is increased. The intensity time series and phase diagrams are drawn and the Lyapunov characteristic exponent is calcd. to characterize the chaotic and periodic regions.

### **Bibliographic Information**

**Spectral studies of naphthalocyanine (Nc) and rare earth phthalocyanine (RePc) molecules in an inorganic glassy borate matrix.** Kumar, G. A.; Thomas, J.; George, N.; Nampoori, V. P. N.; Radhakrishnan, P.; Vallabhan, C. P. G.; Unnikrishnan, V. Solid State Electronics Division, International School of Photonics, Cochin University of Science and Technology, Kochi, India. Phys. Chem. Glasses (2000), 41(4), 199-203.

### **Abstract**

Optical absorption and emission spectral studies of free and metal naphthalocyanine doped borate glass matrix are reported for the first time. Absorption spectra recorded in the UV-VIS-NIR

region show the characteristic absorption bands, namely, the B-band and Q-band of the naphthalocyanine (Nc) mol. Some of the important spectral parameters, namely, the optical absorption coeff. ( $\alpha$ ), molar extinction coeff. ( $\epsilon$ ) and absorption cross section ( $\sigma_a$ ) of the principal absorption transitions are detd. Optical band gap ( $E_g$ ) of the materials evaluated from the functional dependence of absorption coeff. on photon energy lies in the range  $1.6 \text{ eV} \leq E_g \leq 2.1 \text{ eV}$ . All fluorescence spectra except that of EuNc consist of an intense band in the 765 nm region corresponding to the excitation of Q-band. In EuNc the max. fluorescence intensity band is obsd. at 824 nm. The intensity of the principal fluorescence band is max. in ZnNc, whereas it is min. in H2Nc. Radiative parameters of the principal fluorescence transitions corresponding to the Q-band excitation are also reported for the naphthalocyanine and phthalocyanine based matrixes.

### **Bibliographic Information**

**Dynamics of two coupled chaotic multimode Nd:YAG lasers with intracavity frequency doubling crystal.** Kuruvilla, Thomas; Nandakumaran, V. M.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Pramana (2000), 54(3), 393-402

#### **Abstract**

The effect of coupling 2 chaotic Nd:YAG lasers with intracavity KTP crystal for frequency doubling is numerically studied for the case of the laser operating in 3 longitudinal modes. The system goes from chaotic to periodic and then to steady state as the coupling const. is increased. The intensity time series and phase diagrams are drawn and the Lyapunov characteristic exponent is calcd. to characterize the chaotic and periodic regions.

### **Bibliographic Information**

**NO<sub>2</sub> detection with a fiber optic evanescent wave sensor.** Mechery, John Shelly; Thomas, Jayan; Unnikrishnan, K. P.; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Cochin Univ. of Science and Technology, Cochin, India. Proc. SPIE-Int. Soc. Opt. Eng. (1999), 3897(Advanced Photonic Sensors and Applications), 173-178.

#### **Abstract**

A novel approach to detect NO<sub>2</sub> gas is described. An optical fiber-based sensor (FOS) works on the principal of evanescent wave (EW) absorption phenomenon. EW at the uncladded portion of a multi-mode fiber are used for sensor development by replacing this region with a coating of metallophthalocyanine (MPC), thermally deposited at a reduced pressure. MPC are very sensitive to NO<sub>2</sub> gas and there is a change in the EW absorption in the NO<sub>2</sub> environment. Compared to other gas sensing devices, this is a highly sensitive technique. The attraction of this FOS is its simple architecture and ease of operation.

### **Bibliographic Information**

**Optical studies of phthalocyanine molecules in PVA film.** Thomas, J.; Kumar, G. A.; Unnikrishnan, N. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Solid State Electronics Division, Cochin University of Science and Technology, Kochi, India. Mater. Lett. (2000), 44(5), 275-278.

#### **Abstract**

Optical absorption and emission spectra were obtained of various phthalocyanine (Pc) mols. in PVA matrix. The phthalocyanines studied include EuHPc<sub>2</sub>, FePc, LaPc, MnPc, MoOPc,

NdHPc2, and SmHPc2. The optical absorption cross-section ( $\sigma_a$ ), emission cross-section ( $\sigma_e$ ), oscillator strength (f), fluorescence bandwidth ( $\Delta\nu$ ), emission wavelength ( $\lambda$ ), radiative decay time ( $\tau$ ) and optical gain (G) were obtained from spectral data. The emission cross-section and optical gain are max. in the NdHPc2-PVA composite. However, the calcd. emission parameters are manyfold smaller than those obtained using a borate glass matrix.

### **Bibliographic Information**

**Physical and optical properties of phthalocyanine doped inorganic glasses.** Kumar, G. A.; Thomas, J.; George, N.; Unnikrishnan, N. V.; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Solid State Electronics Division, International School of Photonics, Cochin University of Science and Technology, Kochi, India. J. Mater. Sci. (2000), 35(10), 2539-2542.

#### **Abstract**

Phys. and optical properties of various free base and metallic phthalocyanine (Pc) doped glass matrix are reported for the 1st time. Absorption spectral measurements of H2Pc, MnPc, NiPc, CoPc, CuPc, MoOPc, ZnPc and FePc doped borate glass matrix were made in the 200-1100 nm region and the spectra obtained are analyzed in the 2.1-6.2 eV region to obtain the optical band gap ( $E_g$ ) and the width of the band tail ( $E_t$ ). Other important optical and phys. parameters viz. refractive index (n), molar absorptivity ( $\epsilon$ ), d. ( $d$ ), glass transition temp. ( $T_g$ ), mol. concn. (N), polaron radius ( $r_p$ ), intermol. sepn. (R), molar refractivity ( $R_m$ ) are also reported.

### **Bibliographic Information**

**Optical absorption studies of free (H2Pc) and rare earth (RePc) phthalocyanine doped borate glasses.** Kumar, G. A.; Thomas, J.; George, N.; Kumar, B. A.; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.; Unnikrishnan, N. V. Solid State Electronics Division, International School of Photonics, Cochin University of Science and Technology, Kochi, India. Phys. Chem. Glasses (2000), 41(2), 89

#### **Abstract**

Optical absorption studies of free base and rare earth incorporated phthalocyanine doped borate glass matrix are reported. The absorption spectra recorded in the UV-VIS region show two well defined absorption bands of phthalocyanine (Pc) mol., namely the Soret band (B) and the Q band. The Q band always shows its characteristic splitting in all the doped glass matrixes and the intensities of these components are found to vary from one Pc to another. Some of the important optical parameters, namely optical absorption coeff. ( $\sigma$ ), molar extinction coeff. ( $\epsilon$ ), absorption cross section ( $\sigma_a$ ), oscillator strength (f), elec. dipole strength ( $q_2$ ), absorption half bandwidth ( $\Delta\nu$ ) of the principal optical transitions have also been evaluated. Moreover, the spectral dependence of refractive index (n) and thereby the optical dielec. const. ( $\epsilon$ ) on wavelength yielded values of carrier concn. to effective mass ratio (N/m\*) of the phthalocyanine mol. in the present glassy systems. Optical band gap ( $E_g$ ) and width of the band tail ( $E_t$ ) are computed and their variations among the prepd. samples are also discussed.

### **Bibliographic Information**

**Fading of thermoluminescence from CaS and CaS:Ce phosphors.** Joseph, James; Ananthakrishnan, T. R.; Nampoori, V. P. N.; Warier, M. K. Rudra. HMT Colony, St. Paul's College, Kalamassery, India. Indian J. Phys., A (2000), 74A(1), 21-24.

#### **Abstract**

The fading effect of thermoluminescence (TL) from CaS and CaS:Ce is studied for various delay times from 10 s to 3 h. The TL intensity fades off and the TL peak shifts towards high temp. region as the delay time goes on increasing. Doping indicates marked influence in these effects.



### **Bibliographic Information**

**Experimental investigation of optical limiting and thermal lensing in toluene solutions of C70.** Bindhu, C. V.; Harilal, S. S.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. Appl. Phys. B: Lasers Opt. (2000), 70(3), 429-434.

#### **Abstract**

Optical limiting and thermal lensing studies are carried out in C70-toluene solns. The measurements are performed using 9-ns pulses generated from a frequency-doubled Nd:YAG laser at 532 nm. Optical limiting studies in fullerene mols. indicated that reverse saturable absorption is the major mechanism for limiting. Anal. of thermal lensing measurements showed a quadratic dependence of thermal lens signal on incident laser energy, which also supports the view that optical limiting in C70 arises due to sequential 2-photon absorption via excited triplet state (reverse saturable absorption).

### **Bibliographic Information**

**Photoacoustic investigation of the effect of excess lead oxide on thermal diffusivity of PLZT ceramic.** George, N. A.; Paul, T.; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.; Sebastian, M. T. International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Mater. Sci. Lett. (2000), 19(6), 499-501.

#### **Abstract**

Effects of excess lead oxide on thermal diffusivity of PLZT ceramic as detd. by laser induced photoacoustic technique. The increase in thermal diffusivity with increasing excess lead oxide is supposed to be due to the appearance of addnl. defects other than the point defects introduced in the material due to the nonstoichiometry of lead oxide.

### **Bibliographic Information**

**Thermal diffusivity of some polymer supported halogeno benzimidazole complexes of cobalt(II) and copper(II) - a photoacoustic study.** Raman, S. Sankara; Nampoori, V. P. N.; Vallabhan, C. P. G.; Saravanan, N.; Yusuff, K. K. Mohammed. International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Mater. Sci. Lett. (1999), 18(23), 1887-1889.

#### **Abstract**

The thermal diffusivities of some polystyrene supported Schiff base complexes of the type ML<sub>2</sub>X<sub>2</sub> (where M = Co(II) or Cu(II); L = 1-nitrobenzyl-2-nitrophenyl benzimidazole; and X = Cl<sup>-</sup>, Br<sup>-</sup>, or I<sup>-</sup>) were detd. by the laser-induced photoacoustic effect. The effect of the metal as well as the halogen on the thermal diffusivities of these complexes were studied.

### **Bibliographic Information**

**Suppression of chaos through reverse period doubling in coupled directly modulated semiconductor lasers.** Kuruvilla, Thomas; Nandakumar, V. M.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Phys. Lett. A (1999), 254(1,2), 59-64.

## **Abstract**

The effect of coupling on two high frequency modulated semiconductor lasers is numerically studied. The phase diagrams and bifurcation diagrams are drawn. As the coupling const. is increased the system goes from chaotic to periodic behavior through a reverse period doubling sequence. The Lyapunov exponent is calcd. to characterize chaotic and periodic regions.

## **Bibliographic Information**

**Significance of time scales in nonlinear dynamical analysis of electroencephalogram signals.** Indic P; Pratap R; Nampoori V P; Pradhan N Department of Electronics, Cochin University of Science and Technology, Kerala, India INTERNATIONAL JOURNAL OF NEUROSCIENCE (1999 Aug), 99(1-4), 181-94

## **Abstract**

We propose to show in this paper, that the time series obtained from biological systems such as human brain are invariably nonstationary because of different time scales involved in the dynamical process. This makes the invariant parameters time dependent. We made a global analysis of the EEG data obtained from the eight locations on the skull space and studied simultaneously the dynamical characteristics from various parts of the brain. We have proved that the dynamical parameters are sensitive to the time scales and hence in the study of brain one must identify all relevant time scales involved in the process to get an insight in the working of brain.

## **Bibliographic Information**

**Solvent effect on absolute fluorescence quantum yield of rhodamine 6G determined using transient thermal lens technique.** Bindhu, C. V.; Harilal, S. S.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. Mod. Phys. Lett. B (1999), 13(16), 563-576.

## **Abstract**

Dual beam thermal lens technique is successfully employed for the detn. of abs. fluorescence quantum yield of rhodamine 6G laser dye in different solvents. A 532 nm radiation from a Q-switched Nd:YAG laser was used for the excitation purpose. The fluorescence quantum yield values are found to be strongly influenced by environmental effects. It has been obsd. that fluorescence yield is greater for rhodamine 6G in ethylene glycol than in water or in methanol. Our results also indicate that parameters like concn. of the dye soln., aggregate formation, and excited state absorption affect the abs. values of fluorescence yield significantly.

## **Bibliographic Information**

**Suppression of chaos through reverse period doubling in coupled directly modulated semiconductor lasers.** Kuruvilla, Thomas; Nandakumaran, V. M.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Phys. Lett. A (1999), 254(1,2), 59-64.

## **Abstract**

The effect of coupling on two high frequency modulated semiconductor lasers is numerically studied. The phase diagrams and bifurcation diagrams are drawn. As the coupling const. is increased the system goes from chaotic to periodic behavior through a reverse period doubling sequence. The Lyapunov exponent is calcd. to characterize chaotic and periodic regions.

### **Bibliographic Information**

**Evaluation of electrical conductivity and thermal diffusivity of vanadyl naphthalocyanine.** Thomas, J.; Pillai, V. N. S.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Mater. Sci. Lett. (1999), 18(12), 963-964.

#### **Abstract**

The elec. cond. and thermal diffusivity were studied of pristine and I doped vanadyl naphthalocyanine. The cond. activation energies were detd. I doping increases both the elec. cond. and thermal diffusivity.

### **Bibliographic Information**

**Photoacoustic study on photobleaching of Rhodamine 6G doped in poly(methyl methacrylate).** George, Nibu A.; Aneeshkumar, B.; Radhakrishnan, P.; Vallabhan, C. P. G.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Phys. D: Appl. Phys. (1999), 32(14), 1745-1749.

#### **Abstract**

The photobleaching of the lasing dye Rhodamine 6G embedded in the solid matrix poly(Me methacrylate) was investigated using a photoacoustic technique. Chopped laser radiation from an argon ion laser at four different wavelengths was used for the study. Exptl. results indicate that the photobleaching rate is directly proportional to the incident laser power while it decreases with increase in concn. of the dye mols. In the present case we have not obsd. any dependence of photobleaching on the chopping frequency. One-photon absorption is found to be responsible for the photobleaching of the dye within the selected range of laser power.

### **Bibliographic Information**

**Optical limiting and thermal lensing studies in C60.** Harilal, S. S.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Laser Division, Cochin University of Science and Technology, Cochin, India. J. Appl. Phys. (1999), 86(3), 1388-1392.

#### **Abstract**

Optical limiting and thermo-optic properties of C60 in toluene were studied using 532 nm, 9 ns pulses from a frequency-doubled Nd:YAG laser. Optical limiting studies in these fullerene mols. indicated that reverse saturable absorption is the major mechanism for limiting properties in these mols. Thermal lensing measurements are also performed in fullerene solns. The quadratic dependence of thermal lens signal on incident energy confirms that enhanced optical absorption by the sample via excited triplet state absorption may play a leading role in the limiting property.

### **Bibliographic Information**

**Multiphoton absorption studies in aqueous solutions of rhodamine 6G laser dye using transient thermal lens technique.** Bindhu, C. V.; Harilal, S. S.; Bindu, V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Int. School of Photonics, Laser Div., Cochin Univ. of Science and Technology, Cochin, India. Proc. SPIE-Int. Soc. Opt. Eng. (1999), 3729(International Conference on Optics and Optoelectronics '98), 312-317.

## **Abstract**

Dual beam transient thermal lens studies were carried out in aq. solns. of rhodamine 6G using 532 nm pulses from a frequency doubled Nd:YAG laser. Anal. of thermal lens signal shows the existence of different nonlinear processes like 2 photon absorption and 3 photon absorption phenomena along with one photon absorption as well as excited state absorption. Conc. of the dye in the soln. influences the occurrence of the different processes in a significant way.

## **Bibliographic Information**

**Monitoring the rate of pulsed laser deposition of silver thin films using a fiber optic sensor.** John, M. Shelly; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Cochin Univ. of Science and Technology, Cochin, India. Proc. SPIE-Int. Soc. Opt. Eng. (1999), 3666(Photonics India '98), 574-577.

## **Abstract**

A new sensing technique for the in-situ monitoring of the rate of pulsed laser deposition of metal thin films has been developed. This optical fiber-based sensor utilizes the evanescent wave penetration of waveguide modes into the unclad portion of a multimode fiber. The utility of this optical fiber sensor is demonstrated in the case of pulsed laser deposition (PLD) of Ag thin films obtained by a Q-switched Nd:YAG laser which is used to irradiate a Ag target at the required conditions for the prepn. of thin films. In the present paper we describe the performance and characteristics of this sensor and show how this device can be an effective tool for the monitoring of the deposition rate of Ag thin films.

## **Bibliographic Information**

**Investigation of nonlinear absorption and aggregation in aqueous solutions of rhodamine B using thermal lens technique.** Bindhu, C. V.; Harilal, S. S.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. Pramana (1999), 52(4), 435-442.

## **Abstract**

Thermal lensing effect was studied in aq. solns. of rhodamine B using 532 nm, 9 ns pulses from a Nd:YAG laser. A low intensity He-Ne laser beam was used for probing the thermal lens. It is appropriate to use this technique for studying nonlinear absorption processes like two photon absorption or excited state absorption and for analyzing dimerization equil.

## **Bibliographic Information**

**Studies of nonlinear absorption and aggregation in aqueous solutions of rhodamine 6G using a transient thermal lens technique.** Bindhu, C. V.; Harilal, S. S.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Phys. D: Appl. Phys. (1999), 32(4), 407-411.

## **Abstract**

Dual-beam transient thermal lens studies were carried out in aq. solns. of rhodamine 6G using 532 nm pulses from a frequency-doubled Nd:YAG laser. The anal. of the obsd. data showed that the thermal lens method can effectively be used to study the nonlinear absorption and aggregation which are taking place in a dye medium.

### **Bibliographic Information**

**A fiber optic evanescent wave sensor for monitoring the rate of pulsed laser deposition of metal thin films.** John, M. Shelly; Radhakrishnan, P.; Nampoore, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Meas. Sci. Technol. (1999), 10(2), n17-n20.

#### **Abstract**

A novel sensing technique for the in situ monitoring of the rate of pulsed laser deposition (PLD) of metal thin films was developed. This optical fiber based sensor works on the principle of the evanescent wave penetration of waveguide modes into the unclad portion of a multimode fiber. The utility of this optical fiber sensor is demonstrated in the case of PLD of Ag thin films obtained by a Q-switched Nd:YAG laser which was used to irradiate a Ag target at the required conditions for the prepn. of thin films. This paper describes the performance and characteristics of the sensor and shows how the device can be used as an effective tool for the monitoring of the deposition rate of Ag thin films. The fiber optic sensor is very simple, inexpensive and highly sensitive compared with existing techniques for thin film deposition rate measurements.

### **Bibliographic Information**

**Two and three photon absorption in rhodamine 6G methanol solutions using pulsed thermal lens technique.** Bindhu, C. V.; Harilal, S. S.; Kurian, Achamma; Nampoore, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Nonlinear Opt. Phys. Mater. (1998), 7(4), 531-538.

#### **Abstract**

Dual beam transient thermal lens studies were carried out in rhodamine 6G MeOH solns. using 532 nm pulses from a frequency doubled Nd:YAG laser. Anal. of thermal lens signal shows the existence of different nonlinear processes like two photon absorption and three photon absorption phenomena along with one photon absorption. Concn. of the dye in the soln. influences the occurrence of the different processes in a significant way.

### **Bibliographic Information**

**Photoacoustic study of the effect of hydroxyl ion on thermal diffusivity of  $\alpha$  alumina.** Sankara Raman, S.; Nampoore, V. P. N.; Vallabhan, C. P. G.; Ambadas, G.; Sugunan, S. International School of Photonics, Cochin University of Science and Technology, Cochin, Kerala, India. J. Appl. Phys. (1999), 85(3), 1987-1988.

#### **Abstract**

The effect of the chemisorbed hydroxyl groups on the thermal diffusivity of  $\alpha$  alumina is detd. by evaluating the thermal diffusivity at various degassing temps. and by doping it with rare earth oxide using the photoacoustic technique. The thermal diffusivity is found to decrease with an increase in degassing temp. as well as with an increase in the doping concn. of rare earth oxide. This decrease has been attributed to the loss of hydroxyl ion from the  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>.

### **Bibliographic Information**

**Photoemission optogalvanic effect: theory and applications.** Prasad, K. C. Ajith; Nampoore, V. P. N.; Sasikumar, P. R.; Vallabhan, C. P. G.. Laser Division, International School

of Photonics, Cochin University of Science and Technology, Cochin, India. Editor(s): Roy, A. P. Spectrosc., [Int. Conf.] (1997), Meeting Date 1996, 251-256. Publisher: Narosa, India

#### **Abstract**

A review with 15 refs. on theory and applications of photoemission optogalvanic effect.

#### **Bibliographic Information**

**Prompt electron emission and collisional ionization of ambient gas during pulsed laser ablation of silver.** Issac, R. C.; Varier, G. K.; Gopinath, P.; Harilal, S. S.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School Photonics, Cochin University Science Technology, Cochin, India. Appl. Phys. A: Mater. Sci. Process. (1998), A67(5), 557-561.

#### **Abstract**

A Ag target kept under partial vacuum conditions was irradiated with focused nanosecond pulses at 1.06  $\mu\text{m}$  from a Nd:YAG laser. The electron emission monitored with a Langmuir probe shows a clear twin-peak distribution. The 1st peak which is very sharp has only a small delay and it indicates prompt electron emission with energy as much as 60  $\pm$  5 eV. Also the prompt electron emission shows a temporal profile with a width that is same as that for the laser pulse whereas the 2nd peak is broader, covers several microseconds, and represents the low-energy electrons (2  $\pm$  0.5 eV) assocd. with the laser-induced Ag plasma as revealed by time-of-flight measurements. Prompt electrons ejected from the target collisionally excite and ionize ambient gas mols. Clearly resolved rotational structure is obsd. in the emission spectra of ambient N<sub>2</sub> mols. Combined with time-resolved spectroscopy, the prompt electrons can be used as excitation sources for various collisional excitation-relaxation expts. The electron d. corresponding to the 1st peak is estd. to be of the order of 10<sup>17</sup> cm<sup>-3</sup> and it is found that the d. increases as a function of distance away from the target. Dependence of probe current on laser intensity shows plasma shielding at high laser intensities.

#### **Bibliographic Information**

**Thermal diffusivity measurements in organic liquids using transient thermal lens calorimetry.** Bindhu, C. V.; Harilal, S. S.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics Laser Division, Cochin University of Science and Technology, Cochin, India. Opt. Eng. (Bellingham, Wash.) (1998), 37(10), 2791-2794.

#### **Abstract**

Thermal diffusivity measurements are carried out in certain org. liqs. using the pulsed dual beam thermal lens technique. The 532 nm pulses from a frequency doubled Q-switched Nd:YAG laser are used as the heating source and an intensity stabilized He-Ne laser serves as the probe beam. Exptl. detn. of the characteristic time const. of the transient thermal lens signal is verified theor. Measured thermal diffusivity values are in excellent agreement with literature values.

#### **Bibliographic Information**

**Collective behavior of laser-produced plasma from a multicomponent YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> target in air.** Issac, R. C.; Varier, G. K.; Harilal, S. S.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Div., International School Photonics, Cochin Univ. Sci. Technol., Cochin, India. Appl. Phys. B: Lasers Opt. (1998), B67(5), 647-651.

#### **Abstract**

The dynamics of diffusion of electrons and ions from the laser-produced plasma from a

multielement superconducting material, namely YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>, using a Q-switched Nd:YAG laser was investigated by time-resolved emission-spectroscopic techniques at various laser irradiances. Beyond a laser irradiance of  $2.6 \times 10^{11} \text{ W cm}^{-2}$ , the ejected plume collectively drifts away from the target with a sharp increase in velocity to  $1.25 \times 10^6 \text{ cm s}^{-1}$ , which is twice its velocity obsd. at lower laser irradiances. This sudden drift apparently occurs as a result of the formation of a charged double layer at the external plume boundary. This diffusion is collective, i.e., the electrons and ions inside the plume diffuse together simultaneously and hence it is similar to the ambipolar diffusion of charged particles in a discharge plasma.

### **Bibliographic Information**

#### **An optical fiber based evanescent wave sensor to monitor the deposition rate of thin films.**

Jose, Deepa; John, M. Shelly; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Thin Solid Films (1998), 325(1,2), 264-267.

#### **Abstract**

A novel fiber optic sensor for the in situ measurement of the rate of deposition of thin films was developed. Evanescent wave in the uncladded portion of a multimode fiber is utilized for this sensor development. This sensor is useful for the monitoring of the deposition rate of polypyrrole thin films, deposited by an a.c. plasma polymn. method. This technique is simple, accurate and highly sensitive compared with existing techniques.

### **Bibliographic Information**

#### **Twin peak distribution of electron emission profile and impact ionization of ambient molecules during laser ablation of silver target.**

Issac, Riju C.; Gopinath, Pramod; Varier, Geetha K.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Laser Division, Cochin University of Science & Technology, Cochin, India. Appl. Phys. Lett. (1998), 73(2), 163-165.

#### **Abstract**

Laser-induced plasma generated from a Ag target under partial vacuum conditions using the fundamental output of nanosecond duration from a pulsed Nd:Y Al garnet laser was studied using a Langmuir probe. The time of flight measurements show a clear twin peak distribution in the temporal profile of electron emission. The 1st peak has almost the same duration as the laser pulse while the 2nd lasts for several microseconds. The prompt electrons are energetic enough ( $\approx 60 \text{ eV}$ ) to ionize the ambient gas mols. or atoms. The use of prompt electron pulses as sources for electron impact excitation is demonstrated by taking N, CO<sub>2</sub>, and Ar as ambient gases.

### **Bibliographic Information**

#### **Induction of mitotic chromosomal aberrations by lasers in comparison to gamma radiations.**

Pillai, P. R. Unnikrishna; Nambisan, Padma; Nampoori, V. P. N.; Vallabhan, C. P. G.. Department of Biotechnology, Cochin University of Science and Technology, Cochin, India. Yichuan (1997), 19(5), 5-9.

#### **Abstract**

Laser irradsn. at wavelength 514 nm was used to study the effect of lasers in inducing chromosomal aberrations at mitosis in Vicia faba and Allium cepa. A new radiation system which could be used for the induction of mutations was offered. Results were compared with those obtained from studies using  $\gamma$ -rays as irradsn. source.

### **Bibliographic Information**

**Use of mirage effect for the detection of phase transitions in liquid crystals.** Rajasree, K.; Vidyalaal, V.; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.; George, A. K. International School of Photonics, Opto-Electronics Laboratory, Cochin University of Science and Technology, Cochin, India. Mater. Lett. (1998), 36(1-4), 76-80.

#### **Abstract**

The phenomenon of single beam mirage effect, otherwise known as photothermal deflection (PTD) effect using a He-Ne laser beam was employed to detect phase transitions in some liq. crystals. Anomalous changes in amplitude occur in the PTD signal level near the transition temp. The exptl. details and the results of measurements made in liq. crystals E8, M21 and M24 are given.

### **Bibliographic Information**

**Time evolution of the electron density and temperature in laser-produced plasmas from YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>.** Harilal, S. S.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School Photonics, Cochin University Science Technology, Cochin, India. Appl. Phys. B: Lasers Opt. (1998), B66(5), 633-638.

#### **Abstract**

Laser radiation at 1.06  $\mu$ m from a pulsed Nd:YAG laser was focused onto a multielement YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> target in vacuum and the plasma thus generated was studied using time-resolved spectroscopic techniques. Line broadening of the Ba I emission line at 553.5 nm was monitored as a function of time elapsed after the incidence of a laser pulse on the target. Measured line profiles of Ba species were used to infer the electron d. and temp., and the time evolution of these important plasma parameters was worked out.

### **Bibliographic Information**

**Temporal and spatial behavior of electron density and temperature in a laser-produced plasma from YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>.** Harilal, S. S.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School Photonics, Cochin University Science Technology, Cochin, India. Appl. Spectrosc. (1998), 52(3), 449-455.

#### **Abstract**

Spectroscopic studies of laser-induced plasma from a high-temp. superconducting material, viz., YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> (YBCO), have been carried out. Electron temp. and electron d. measurements were made from spectral data. The Stark broadening of emission lines was used to det. the electron d., and the ratio of line intensities was exploited for the detn. of electron temp. An initial electron temp. of 2.35 eV and electron d. of  $2.5 \times 10^{17}$  cm<sup>-3</sup> were obsd. The dependence of electron temp. and d. on different exptl. parameters such as distance from the target, delay time after the initiation of the plasma, and laser irradiance is also discussed in detail.

### **Bibliographic Information**

**Dynamics of laser produced silver plasma under film deposition conditions studied using optical emission spectroscopy.** Issac, Riju C.; Vasudevan Pillai, K.; Harilal, S. S.; Varier, Geetha K.; Bindhu, C. V.; Gopinath, Pramod; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Laser Division, Cochin University of Science and



Technology, Cochin, India. Appl. Surf. Sci. (1998), 125(2), 227-235.

### **Abstract**

Laser produced plasma from Ag is generated using a Q-switched Nd:YAG laser. Optical emission spectroscopy is used to carry out time of flight (TOF) anal. of at. particles. An anomalous double peak profile in the TOF distribution is obsd. at low pressure. A collection of slower species emerge at reduced pressure  $< 4 \times 10^{-3}$  mbar and this species has a greater velocity spread. At high pressure the plasma expansion follows the shock-wave model with cylindrical symmetry whereas at reduced pressure it shows unsteady adiabatic expansion (UAE). During UAE the species show a parabolic increases in the expansion time with radial distance whereas during shock wave expansion the exponent is  $< 1$ . The angular distribution of the ablated species in the plume is obtained from the measurement of absorbance of thin films deposited on to glass substrates kept perpendicular to the plume. There is a sharp variation in the film thickness away from the film center due to asymmetries in the plume.

### **Bibliographic Information**

**Influence of ambient gas on the temperature and density of laser produced carbon plasma.** Harilal, S. S.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Laser Division, Cochin University of Science and Technology, Cochin, India. Appl. Phys. Lett. (1998), 72(2), 167-169.

### **Abstract**

The effect of ambient gas on the dynamics of the plasma generated by laser ablation of a C target using  $1.06 \mu\text{m}$  radiation from a Q-switched Nd:YAG laser has been studied using a spectroscopic technique. The emission characteristics of the C plasma produced in Ar, He and air atm depend strongly on the nature and pressure of the surrounding gas. It has been obsd. that hotter and denser plasma are formed in an Ar atm. rather than in He or air as an ambient.

### **Bibliographic Information**

**Anomalous profile of a self-reversed resonance line from Ba<sup>+</sup> in a laser produced plasma from YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>.** Issac, Riju C.; Harilal, S. S.; Bindhu, C. V.; Varier, Geetha K.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. Spectrochim. Acta, Part B (1997), 52B(12), 1791-1799

### **Abstract**

A laser produced plasma from the multielement solid target YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> is generated using  $1.06 \mu\text{m}$ , 9 ns pulses from a Q-switched Nd:YAG laser in air at atm. pressure. A time resolved anal. of the profile of the 4554.03 Å resonance line emission from Ba II at various laser power densities has been carried out. It has been found that the line has a profile which is strongly self-reversed. It is also obsd. that at laser power densities equal to or exceeding  $1.6 \times 10^9 \text{ W cm}^{-2}$ , a third peak begins to develop at the center of the self-reversed profile and this has been interpreted as due to the anisotropic resonance scattering (fluorescence). The no. densities of singly ionized barium ions evaluated from the width of the resonance line as a function of time delay with respect to the beginning of the laser pulse give typical values of the order of  $10^{19} \text{ cm}^{-3}$ . The higher ion concns. existing at smaller time delays are seen to decrease rapidly. The Ba II ions in the ground state resonantly absorb the radiation and this absorption is max. around 120 ns after the laser pulse.

### **Bibliographic Information**

**Fine structure in the time of flight distribution of C<sub>2</sub> in laser produced plasma from graphite.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. *Pramana* (1997), 49(3), 317-322.

#### **Abstract**

Time resolved optical emission spectroscopy is employed to study the expansion dynamics of C<sub>2</sub> species in a graphite plasma produced during the Nd: YAG ablation. At low laser fluences a single peak distribution with low kinetic energy is obsd. At higher fluences a twin peak distribution is found. These double peak time of flight distribution splits into a triple peak structure at distances  $\square$  17 mm from the target surface. The reason for the occurrence of multiple peak is due to different formation mechanisms of C<sub>2</sub> species.

### **Bibliographic Information**

**Spatial analysis of C<sub>2</sub> band emission from laser produced plasma.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. *Plasma Sources Sci. Technol.* (1997), 6(3), 317-322.

#### **Abstract**

Time and space resolved spectroscopic studies of the mol. band emission from C<sub>2</sub> are performed in the plasma produced by irradiating a graphite target with 1.06  $\square$ m radiation from a Q-switched Nd:YAG laser. High-resoln. spectra are recorded from points located at distances up to 15 mm from the target in the presence of ambient He gas pressure. Depending on the laser irradiance, time of observation and position of the sampled vol. of the plasma the features of the emission spectrum change drastically. The vibrational temp. and population distribution in the different vibrational levels of C<sub>2</sub> mols. were evaluated as a function of distance for different time delays and laser irradiance. Also the vibrational temp. of C<sub>2</sub> mols. decreases with increasing He pressure.

### **Bibliographic Information**

**Time resolved study of CN band emission from plasma generated by laser irradiation of graphite.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Gopinath, Pramod; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. *Spectrochim. Acta, Part A* (1997), 53A(10), 1527-1536.

#### **Abstract**

Time and space resolved studies of emission from CN mols. were carried out in the plasma produced from graphite target by 1.06  $\square$ m pulses from a Q-switched Nd:YAG laser. Depending on the laser pulse energy, time of observation and position of the sampled vol. of the plasma, the features of the emission spectrum change drastically. The vibrational temp. and population distribution in the different vibrational levels were studied as functions of distance, time, laser energy and ambient gas pressure. Evidence for nonlinear effects of the plasma medium such as self focusing which exhibits threshold-like behavior are also obtained. Temp. and electron d. of the plasma were evaluated using the relative line intensities of successive ionization stages of carbon atom. These electron d. measurements are verified by using Stark broadening method.

### Bibliographic Information

**Electron density and temperature measurements in a laser produced carbon plasma.** Harilal, S. S.; Bindhu, C. V.; Issac, Riju C.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Laser Division, Cochin University of Science + Technology, Cochin, India. J. Appl. Phys. (1997), 82(5), 2140-2146.

#### **Abstract**

Plasma generated by fundamental radiation from a Nd:YAG laser focused onto a graphite target is studied spectroscopically. Measured line profiles of several ionic species were used to infer electron temp. and d. at several sections located in front of the target surface. Line intensities of successive ionization states of carbon were used for electron temp. calcns. Stark broadened profiles of singly ionized species have been utilized for electron d. measurements. Electron d. as well as electron temp. were studied as functions of laser irradiance and time elapsed after the incidence of laser pulse. The validity of the assumption of local thermodyn. equil. is discussed in light of the results obtained.

### Bibliographic Information

**Possibility of waveguide formation on organic nonlinear crystal methyl para-hydroxy benzoate using high energy ion irradiation.** Sreeramana Aithal, P.; Nagaraja, H. S.; Mohan Rao, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.; Avasthi, D. K. Department of Electronics, NSAM College, Nitte-574 110, India. Nucl. Instrum. Methods Phys. Res., Sect. B (1997), 129(2), 217-220.

#### **Abstract**

Org. nonlinear optical single crystals of Me-p-hydroxy benzoate (MHB) were grown using gel-soln. technique. These crystals are cut along z-axis and are bombarded with Ag<sup>14+</sup> ions of energy 100 MeV. The results show an increase in refractive index at the ion irradiated region. The dielec. const. of the irradiated crystal is increased >15 times compared to that of a nonirradiated crystal. The result of these changes and comparative study of 2nd harmonic generation (SHG) efficiency before and after irradiation is discussed.

### Bibliographic Information

**Investigations on nanosecond laser produced plasma in air from the multi-component material YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>.** Varier, Geetha K.; Isaac, Riju C.; Harilal, S. S.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Div., International Sch. Photonics, Cochin Univ. Sci. Technol., Cochin, India. Spectrochim. Acta, Part B (1997), 52B(5), 657-666.

#### **Abstract**

The laser produced plasma from the multi-component target YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> was analyzed using Michelson interferometry and time resolved emission spectroscopy. The interaction of 10 ns pulses of 1.06  $\mu$ m radiation from a Q-switched Nd:YAG laser at laser power densities ranging from 0.55 GW cm<sup>-2</sup> to 1.5 GW cm<sup>-2</sup> was studied. Time resolved spectral measurements of the plasma evolution show distinct features at different points in its temporal history. For a time duration of <55 ns after the laser pulse (for a typical laser powder d. of 0.8 GW cm<sup>-2</sup>), the emission spectrum is dominated by black-body radiation. During cooling after 55 ns the spectral emission consists mainly of neutral and ionic species. Line averaged electron densities were deduced from interferometric line intensity measurements at various laser powder densities. Plasma electron densities are of the order of 10<sup>17</sup> cm<sup>-3</sup> and the plasma temp. at the core region is .aprx.1 eV. The measurement of plasma emission line intensities of various ions inside the

plasma gave evidence of multiphoton ionization of the elements constituting the target at low laser power densities. At higher laser power densities the ionization mechanism is collision dominated. For elements such as N present outside the target, ionization is due to collisions, only.

### **Bibliographic Information**

**Optical emission studies of C<sub>2</sub> species in laser-produced plasma from carbon.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Phys. D: Appl. Phys. (1997), 30(12), 1703-1709.

#### **Abstract**

Optical emission studies of C<sub>2</sub> mols. in plasma obtained by Nd:YAG laser ablation of graphite in a helium atm. are reported for irradiances in the range (1-9.2) × 10<sup>10</sup> W cm<sup>-2</sup>. The characteristics of the spectral emission intensity from the C<sub>2</sub> (Swan band) species have been investigated as functions of the distance from the target, ambient pressure and laser irradiance. Ests. of vibrational temps. of C<sub>2</sub> species under various irradiance conditions are made. Results of measurements performed under different ambient helium gas pressures are also discussed.

### **Bibliographic Information**

**Emission characteristics and dynamics of C<sub>2</sub> from laser-produced graphite plasma.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science & Technology, Cochin, India. J. Appl. Phys. (1997), 81(8, Pt. 1), 3637-3643.

#### **Abstract**

The emission features of a laser-ablated graphite plume generated in a helium ambient atm. have been investigated with a time- and space-resolved plasma diagnostic technique. Time-resolved optical emission spectroscopy was employed to reveal the velocity distribution of different species ejected during ablation. At lower values of laser fluences, only a slowly propagating component of C<sub>2</sub> is seen. At high fluences, emission from C<sub>2</sub> shows a twin peak distribution in time. The formation of an emission peak with diminished time delay giving an energetic peak at higher laser fluences is attributed to many-body recombination. It is also obsd. that these double peaks get modified into triple peak time-of-flight distribution at distances greater than 16 mm from the target. The occurrence of multiple peaks in the C<sub>2</sub> emission is mainly due to the delays caused from the different formation mechanism of C<sub>2</sub> species. The velocity distribution of the faster peak exhibits an oscillating character with distance from the target surface.

### **Bibliographic Information**

**Photoacoustic signal saturation and optical limiting in C<sub>70</sub>-toluene solution.** Issac, Riju C.; Harilal, S. S.; Varier, Geetha K.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Laser Division, Cochin University of Sciences and Technology, Cochin, India. Opt. Eng. (Bellingham, Wash.) (1997), 36(2), 332-336.

#### **Abstract**

Pulsed photoacoustic studies in solns. of C<sub>70</sub> in toluene are made using the 532-nm radiation from a frequency-doubled Nd:YAG laser. Contrary to expectation, there is no photoacoustic (PA) signal enhancement in the power-limiting range of laser fluences. Instead, the PA signal tends to sat. during optical power-limiting phenomenon. This could be due to the enhanced optical

absorption from the photoexcited state and hence the depletion of the ground-state population. PA measurements also ruled out the possibility of multiphoton absorption in the C70 soln. The nonlinear absorption leading to optical limiting is mainly due to reverse saturable absorption.

### **Bibliographic Information**

**Time resolved analysis of C2 emission from laser induced graphite plasma in helium atmosphere.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Int. Sch. Photonics, Cochin Univ. Sci. Technol., Cochin, India. Jpn. J. Appl. Phys., Part 1 (1997), 36(1A), 134-138.

#### **Abstract**

The authors report time resolved study of C2 emission from laser produced C plasma in presence of ambient He gas. The 1.06  $\mu$ m radiation from a Nd:YAG laser was focused onto a graphite target where it produced a transient plasma. Double peak structure in the time profile of C2 species were obsd. The twin peaks were obsd. only after a threshold laser fluence. Probably the faster velocity component in the temporal profiles originates mainly due to recombination processes. The laser fluence and ambient gas dependence of the double peak intensity distribution is also reported.

### **Bibliographic Information**

**A fiber optic sensor to measure surface tension.** Deepthy, A.; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Indian J. Phys., B (1996), 70B(6), 527-530.

#### **Abstract**

A simple fiber optic sensor based on the coupling of light from one optical fiber to another through a liq. drop is discussed. The drop period measured from the fiber drop trace obtained on a chart recorder, is used to calc. the surface tension of the liqs. used in the expt.

### **Bibliographic Information**

**Characterization of potassium doped GdBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> using Raman spectroscopy and x-ray diffraction. [Erratum to document cited in CA124:329709].** Thomas, Preethi Cicily; Manoj, Jumar K.; Nayar, V. Unnikrishnan; Vidyalaal, V.; Vallabhan, C. P. G.. Dep. Optoelectron., Univ. Kerala, Trivandrum, India. Mod. Phys. Lett. B (1996), 10(23), 1159.

#### **Abstract**

The authors correct captions to Figs. 3-11.

### **Bibliographic Information**

**Photoemission optogalvanic studies with copper as target electrode.** Ajithprasad, K. C.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, School of Photonics, Cochin University of Science and Technology, Cochin, India. Appl. Surf. Sci. (1996), 103(4), 465-470.

#### **Abstract**

Photoemission optogalvanic (POG) effect was obsd. by irradiating Cu target electrode, in a N discharge cell using 1.06  $\mu$ m and frequency doubled 532 nm Nd:YAG laser pulse. Measurement

of the nature of the variation of POG signal strength with 532 nm laser fluence confirms the two photon induced photoelec. emission from Cu. However, using 1.06  $\mu$ m laser pulses thermally assisted photoemission is obsd.

### **Bibliographic Information**

**Pulsed photoacoustic determination of absolute fluorescent quantum yield of the laser dye rhodamine B.** Bindhu, C. V.; Harilal, S. S.; Issac, Riju C.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School Photonics, Cochin Univ. Science & Technology, Cochin, India. Mod. Phys. Lett. B (1996), 10(22), 1103-1110.

#### **Abstract**

Pulsed photoacoustic technique which is found to be a very convenient and accurate method, is used for the detn. of abs. fluorescence quantum yield of laser dye rhodamine B. Concn. and power dependence of quantum yield of rhodamine B in methanol for excitation at 532 nm is reported here. Results show that a rapid decrease in quantum yield as the concn. is increased and finally it reaches the limit corresponding to fluorescence quenching.

### **Bibliographic Information**

**Study of laser ablation in liquids using pulsed photoacoustic technique.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International Sch. Photonics, Cochin Univ. Sci. Technol., Cochin, India. Mod. Phys. Lett. B (1996), 10(21), 1053-1057.

#### **Abstract**

Laser ablation processes in liq. benzene, toluene and carbon disulfide have been investigated by pulsed photoacoustic technique using 532 nm radiation from a frequency doubled Q-switched Nd:YAG laser. The nature of variation of photoacoustic signal amplitude with laser energy clearly indicates that different phenomena are involved in the generation of photoacoustic effect and these are discussed in detail. Our results suggest multiphoton induced photofragmentation as the most plausible interaction process occurring during laser ablation in these liqs.

### **Bibliographic Information**

**Temporal and spatial evolution of C<sub>2</sub> in laser-induced plasma from graphite target.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School Photonics, Cochin Univ. Science & Technology, Cochin, India. J. Appl. Phys. (1996), 80(6), 3561-3565.

#### **Abstract**

Laser ablation of graphite has been carried out using 1.06  $\mu$ m radiation from a Q-switched Nd:YAG laser, and the time of flight distribution of mol. C<sub>2</sub> present in the resultant plasma is investigated in terms of distance from the target as well as laser fluences employing the time-resolved spectroscopic technique. At low laser fluences, the intensities of the emission lines from C<sub>2</sub> shows a twin peak distribution in time. The occurrence of the faster velocity component at higher laser fluences is explained as due to species generated from recombination processes while the delayed peak is attributed to dissocn. of higher carbon clusters resulting in the generation of C<sub>2</sub> mol. Anal. of measured data provides a fairly complete picture of the evolution and dynamics of C<sub>2</sub> species in the laser-induced plasma from graphite.

### Bibliographic Information

**Measurements of electromagnetic shielding effect using HTSC materials.** Vidyalaal, V.; Rajasree, K.; Vallabhan, C. P. G.. Opto-Electronic Lab., Cochin Univ. of Sci. and Technology, Cochin, India. Mod. Phys. Lett. B (1996), 10(7), 293-297.

#### **Abstract**

A simple exptl. set-up is described to measure the electromagnetic shielding property of high T<sub>c</sub> superconducting samples. Measurements were performed using HTSC materials in the form of laser ablated thin films, powders and sintered pellets. Samples used were Gd-123 in pure and doped form as well as a few Bi-based superconducting ceramics. For comparison, similar measurements were carried out on metals like aluminum, copper and  $\square$  metal. Very effective shielding was obsd. for HTSC materials compared to the conventional materials mentioned above. However, it also depended on the sample types and poor shielding was obsd. for powd. HTSC material in comparison to thin films prepd. by laser ablation.

### Bibliographic Information

**Electron density determination of laser induced plasma from polymethyl methacrylate using phaseshift detection techniques.** Varier, Geetha K.; Harilal, S. S.; Bindhu, C. V.; Issac, Riju C.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Div., Internat. Sch. Technol., Cochin, India. Mod. Phys. Lett. B (1996), 10(6), 235-239.

#### **Abstract**

Irradn. of a Polymethyl methacrylate target using a pulsed Nd-YAG laser causes plasma formation in the vicinity of the target. The refractive index gradient due to the presence of the plasma is probed using phase-shift detection technique. The phase-shift technique is a simple but sensitive technique for the detn. of laser ablation threshold of solids. The no. d. of laser-generated plasma above the ablation threshold from PMMA is calcd. as a function of laser fluence. The no. d. varies (2-20)  $\square$  10<sup>16</sup> cm<sup>-3</sup> in the fluence interval 2.8-13 J cm<sup>-2</sup>.

### Bibliographic Information

**A study of photoacoustic effects and optical limiting in the solution of C<sub>60</sub> in toluene.** Issac, Riju C.; Bindhu, C. V.; Harilal, S. S.; Varier, Geetha K.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Div., Cochin Univ. Sci. Technol., Cochin, India. Mod. Phys. Lett. B (1996), 10(1 & 2), 61-67.

#### **Abstract**

Pulsed photoacoustic studies in soln. of C<sub>60</sub> in toluene were made using the 532 nm radiation from a frequency doubled Nd:YAG laser. Though C<sub>60</sub> is found to exhibit the phenomenon of optical limiting, the results on photoacoustic measurements do not give any indication of multiphoton transitions as suggested in some of the earlier works. Results of photoacoustic measurements show that excited state absorption is the dominant process responsible for optical limiting while phenomena like nonlinear scattering may contribute to a lesser extent.

### Bibliographic Information

**Photoacoustic studies on multilayer dielectric coatings.** Philip, Annieta; Radhakrishnan, P.; Nampoori, V. P.; Vallabhan, C. P. G.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. J. Phys. D: Appl. Phys. (1996), 29(5), 1387-1388.

## Abstract

A polemic in reply to comments of J. Philip (ibid, 1386).

## Bibliographic Information

**Spatial and time resolved analysis of CN bands in the laser induced plasma from graphite.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Varier, Geetha K.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School of Photonics, Cochin University of Science and Technology, Cochin, India. Pramana (1996), 46(2), 145-151.

## Abstract

Anal. of the emission bands of the CN mols. in the plasma generated from a graphite target irradiated with 1.06  $\mu$ m radiation pulses from a Q-switched Nd:YAG laser was done. Depending on the position of the sampled vol. of the plasma plume, the intensity distribution in the emission spectra is found to change drastically. The vibrational temp. and population distribution in the different vibrational levels were studied as function of distance from the target for different time delays with respect to the incidence of the laser pulse. The translational temp. calcd. from time of flight is higher than the obsd. vibrational temp. for CN mols. and the reason for this is explained.

## Bibliographic Information

**Characterization of potassium-doped GdBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> using Raman spectroscopy and x-ray diffraction.** Thomas, Preethi Cicily; Manoj, Kumar K.; Nayar, V. Unnikrishnan; Vidyalal, V.; Vallabhan, C. P. G.. Dep. Optoelectron., Univ. Kerala, Trivandrum, India. Mod. Phys. Lett. B (1995), 9(26 & 27), 1739-52.

## Abstract

Potassium-doped and undoped GdBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> have been prepd. and superconducting transition temps. between 92 and 100 K have been detd. from resistivity measurements. Raman spectra of doped and undoped samples are identical and they contain bands corresponding to both the superconducting orthorhombic phase and nonsuperconducting tetragonal phase. X-ray diffraction patterns also reveal both the phases. Raman spectra recorded at 92 K of undoped GdBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> and doped GdBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> with wt. percentages 0.75, 1.00, 1.25, and 1.50 of K shows a softening of the band at 338 cm<sup>-1</sup>.

## Bibliographic Information

**Measurement of the absolute fluorescence quantum yield of rhodamine B solution using a dual-beam thermal lens technique.** Bindhu, C. V.; Harilal, S. S.; Varier, Geetha K.; Issac, Riju C.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International Sch. Photonics, Cochin Univ. Sci. Technol., Cochin, India. J. Phys. D: Appl. Phys. (1996), 29(4), 1074-9.

## Abstract

The dual-beam thermal lens technique is very effective for the measurement of fluorescence quantum yields of dye solns. The concn.-dependence of the quantum yield of rhodamine B in MeOH is studied here using this technique. The obsd. results are in line with the conclusion that the redn. in the quantum yield in the quenching region is essentially due to the nonradiative relaxation of the absorbed energy. The thermal lens was found to become aberrated >40 mW of pump laser power. This low value for the upper limit of pump power is due to the fact that the medium is a reasonably absorbing 1.



### Bibliographic Information

**Measurement of thermal diffusivity of some halogeno benzimidazole complexes of cobalt(II), copper(II) and copper(I) using laser induced photoacoustic effect.** Raman, S. Sankara; Nampoori, V. P. N.; Vallabhan, C. P. G.; Saravanan, N.; Yusuff, K. K. Mohammed. International Sch. of Photonics and Dep. of Applied Chemistry, Cochin Univ. of Science and Technology, Kerala, India. J. Mater. Sci. Lett. (1996), 15(3), 230-1.

#### **Abstract**

Thermal diffusivities were detd. of  $CuL_2X_2$  and  $CoL_2X_2$  (L = 1-nitrobenzyl-2-nitrophenyl benzimidazole; X = Cl, Br, or I) complexes by using the laser induced photoacoustic technique. The exptl. set-up is described in some details. In the case of  $CoL_2X_2$ , the thermal diffusivity increases in the order X = Cl, Br, I, while the reverse is the case for  $CuL_2X_2$ .

### Bibliographic Information

**Electrical conductivity and thermal diffusivity of zinc naphthalocyanine.** Thomas, J.; Pillai, V. N. Sivasankara; Xavier, E.; Vallabhan, C. P. G.. Sch. Photonics, Cochin Univ. Sci. Technol., Cochin, India. J. Mater. Sci. Lett. (1996), 15(2), 151-2.

#### **Abstract**

Elec. cond. and thermal diffusivity of zinc naphthalocyanine (ZnNc) and iodine doped ZnNc are studied. The elec. cond. of pristine ZnNc shows an increase in cond. with temp. Doping with iodine enhances the elec. cond. For the iodine doped ZnNc samples the Arrhenius plot gives two distinct regions with activation energies 0.05 eV and 0.14 eV. The thermal diffusivity  $\alpha$  is related to the characteristic frequency  $f_c$  by a Rosencwaig-Gersho relationship. Calcn. indicates that doping with iodine enhances the thermal diffusivity in zinc naphthalocyanines.

### Bibliographic Information

**Evanescence wave sensor to monitor the etching rate of an optical fiber.** Lovely, M. R.; Radhakrishnan, P.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School Photonics, Cochin University Science & Technology, Cochin, India. Indian J. Pure Appl. Phys. (1996), 34(1), 34-5.

#### **Abstract**

The design and development of an evanescent wave sensor to det. the etching rate of the core of an optical fiber is discussed. The working of the device is based on the principle of propagation and loss of the evanescent wave in the cladding region of the fiber. The fraction of light intensity creeping out of the core of an unclad fiber is a function of the core radius. As this radius decreases, the evanescent wave coupling to the medium surrounding the core enhances. This results in a decrease of the transmitted light intensity through the fiber. This technique is useful to design and fabricate optical fibers with different core geometries.

### Bibliographic Information

**Laser induced thermal lens effect in rhodamine B - signature of resonant two photon absorption.** Bindhu, C. V.; Harilal, S. S.; Issac, Riju C.; Varier, Geetha K.; Nampoori, V. P. N.; Vallabhan, C. P. G.. International School Photonics, Cochin University Science Technology, Cochin, India. Mod. Phys. Lett. B (1995), 9(22), 1471-7.

## **Abstract**

Measurement of the thermal lensing signal as a function of laser power made in Rhodamine B solns. in methanol gave evidence of a two photon absorption process within certain concn. ranges when a 488 nm Ar<sup>+</sup> laser beam was used as the pump source. Only one photon processes were found to occur when 514 nm and 476 nm beams are used as the pump.

## **Bibliographic Information**

**Photoacoustic study of the effect of degassing temperature on thermal diffusivity of hydroxyl loaded alumina.** Raman, S. Sankara; Nampoori, V. P. N.; Vallabhan, C. P. G.; Ambadas, G.; Sugunan, S. International School of Photonics, Cochin University of Science and Technology, Kerala, India. Appl. Phys. Lett. (1995), 67(20), 2939-41.

## **Abstract**

The thermal diffusivity of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> is detd. by the photoacoustic method. The method is calibrated by detg. the thermal diffusivity of Cu and Al. The effect of the chemisorbed hydroxyl groups on thermal diffusivity is studied by degassing the sample at different temps.

## **Bibliographic Information**

**CW-Ar<sup>+</sup> laser induced structural and optical properties of amorphous Sb<sub>2</sub>Se<sub>3</sub> films.** Jayakumar, S.; Balasubramanian, C.; Narayandass, Sa. K.; Mangalaraj, D.; Vallabhan, C. P. Girija. Department Physics, PSG College Technology, Coimbatore, India. Mater. Res. Bull. (1995), 30(9), 1141-51.

## **Abstract**

Amorphous and polycryst. Sb<sub>2</sub>Se<sub>3</sub> films (95-350 nm) were prepd. by thermal evapn. under a vacuum of  $1.33 \times 10^{-3}$  Pa onto well cleaned glass substrates by maintaining the substrate temp. at 303 and 493K resp. Structure of the deposited films were analyzed using XRD and scanning electron microscope. The stoichiometric compn. of the films have been achieved by controlling the rate of evapn. and confirmed by EDAX and RBS techniques. Using a beam probe technique, in which the CW-Ar<sup>+</sup> laser is used as a source to induce cryst. phase change over amorphous Sb<sub>2</sub>Se<sub>3</sub> films and low power He-Ne laser is used as probe beam to study the transmission characteristics of irradiated spots. This study provides valuable information about optical recording characteristic of Sb<sub>2</sub>Se<sub>3</sub> films and its use as phase change optical storage device using highly focussed laser beam in the area of high d. information storage media. The effect of power, power d., time of laser irradiation, scanning speed and thicknesses of films on percentage change in transmittance were investigated and the results are analyzed based on amorphous-cryst. phase transformation.

## **Bibliographic Information**

**Subcritical Hopf bifurcation in Ne-Nd hollow cathode discharge (Physics Letters A 196 (1994) 191).** Sasi Kumar, P. R.; Nampoori, V. P. N.; Vallabhan, C. P. G. Phys. Lett. A (1995), 199(5,6), 416.

## **Bibliographic Information**

**Observation of multiphoton process in liquid CS<sub>2</sub> using pulsed photoacoustic technique.** Harilal, S. S.; Issac, Riju C.; Bindhu, C. V.; Varier, Geetha K.; Nampoori, V. P. N.; Vallabhan, C. P. G. School Photonics, Cochin University Science Technology, Cochin, India. Mod. Phys. Lett. B (1995), 9(14), 871-6.

## Abstract

Pulsed photoacoustic measurements have been carried out in liq. CS<sub>2</sub> using 532 nm radiation from a frequency doubled Nd:YAG laser. Variation of signal amplitude with laser fluence clearly indicates the role of multiphoton processes in the generation of photoacoustic effect. It is also shown that four photon induced disson. and five photon induced ionization are likely processes in CS<sub>2</sub> and 532 nm radiation.

## Bibliographic Information

**Photoemission optogalvanic effect near the instability region of a hollow cathode discharge.** Sasi Kumar, P. R.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, International School of Photonics, Cochin University of Science and Technology, Cochin, India. Opt. Commun. (1995), 118(5,6), 525-8.

## Abstract

The photoemission optogalvanic (POG) effect was studied in a Ne-Nd hollow cathode discharge using continuous-wave laser excitation. Both pos. and neg. effects were obsd. The amplitude of the POG signal was unstable near the instability region of the discharge.

## Bibliographic Information

**Pulsed photoacoustic technique to study nonlinear processes in liquids: results in toluene.** Bindhu, C. V.; Harilal, S. S.; Issac, Riju C.; Varier, Geetha K.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Sch. of Photonics, Cochin Univ. of Science and Technology, Cochin, India. Pramana (1995), 44(3), 231-5.

## Abstract

Pulsed photoacoustic measurements were carried out in toluene at  $\lambda = 532$  nm using a Q-switched frequency doubled Nd:YAG laser. The variation of photoacoustic signal amplitude with incident laser power indicates that at lower laser powers 1 photon absorption takes place at this wavelength while a clear 2 photon absorption occurs in this liq. at higher laser powers. Pulsed photoacoustic technique is simple and effective for the study of multiphoton processes in liqs.

## Bibliographic Information

**Anomalous variation of thermal lens signal with concentration from Rhodamine B in methanol solution.** Bindhu, C. V.; Harilal, S. S.; Issac, Riju C.; Varier, Geetha K.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Sch. of Photonics, Cochin Univ. of Science and Technology, Cochin, India. Pramana (1995), 44(3), 225-9.

## Abstract

Thermal lens signals in solns. of Rhodamine B laser dye in MeOH are measured using the dual beam pump-probe technique. The nature of variations of signal strength with concn. is different for 514 and 488 nm Ar<sup>+</sup> laser excitations. Both the pump wavelengths produce an oscillatory type variation of thermal lens signal amplitude with the concn. of the dye soln. Probable reasons for this peculiar behavior (which is absent in the case of fluorescent intensity) are mentioned.

## Bibliographic Information

**Subcritical Hopf bifurcation in Ne-Nd hollow cathode discharge. [Erratum to document cited in CA122:120652].** Sasi Kumar, P. R.; Nampoori, V. P. N.; Vallabhan, C. P. G.. Laser Division, Department of Physics, Cochin University of Science and Technology, Cochin, India.

Phys. Lett. A (1995), 199(5,6), 416.

**Abstract**

The errors were not reflected in the abstr. or the index entries.

**Bibliographic Information**

**Detection of phase transitions in liquid crystals using the mirage effect.** Rajasree, K.; Vidyalaal, V.; Radhakrishnan, P.; Nampoory, V. P. N.; Vallabhan, C. P. G.; George, A. K. Phys. Dep., Cochin Univ. Sci. Technol., Kerala, India. Liq. Cryst. (1995), 18(1), 167-9.

**Abstract**

The authors describe here a novel technique which makes use of the photothermal mirage effect to study phase transition in liq. crystals. Results of the measurements done with two nematic liq. crystals are given to illustrate this technique. The authors observe an enhancement in the signal amplitude during phase change which is due to the large magnitude of the refractive index gradient developing at the transition temp.

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