J. Ocean Univ. China (Oceanic and Coastal Sea Research)
DOI 10.1007/s11802-016-2606-8
ISSN 1672-5182, 2016 15 (6): 1080-1086
http://www.ouc.edu.cn/xbywb/
E-mail:xbywb@ouc.edu.cn

Trend in Coral-Algal Phase Shift in the Mandapam Group of Islands, Gulf of Mannar Marine Biosphere Reserve, India

M. Machendiranathan[1)], L. Senthilnathan[1), 2)], R. Ranith[1), 3)], A. Saravanakumar[1)], T. Thangaradjou[1), 4), *], S. B. Choudhry[5)], and S. K. Sasamal[5)]

1) *Center of Advanced Studies in Marine Biology*, *Faculty of Marine Sciences*, *Annamalai University*, *Parangipettai* – 608502, *Tamilnadu*, *India*
2) *Academy of Maritime Education and Training* (*AMET*) *University*, *Center for Maritime Information Services*, *Chennai* – 603112, *Tamilnadu*, *India*
3) *Central Marine Fisheries Research Institute* (*CMFRI*), *Fishery Environment Management Division*, *Kochi* – 682018, *Kerala*, *India*
4) *Science and Engineering Research Board* (*SERB*), *New Delhi* – 110070, *India*
5) *National Remote Sensing Center*, *Indian Space Research Organization*, (*Dept. of Space*, *Govt. of India*), *Balanagar*, *Hyderabad* – 500625, *Andhra Pradesh*, *India*

(Received July 4, 2015; revised May 11, 2016; accepted June 6, 2016)

Abstract The present study revealed proliferation of macro-algae modifying coral reef ecosystems in a different manner due to diseases and sedimentations in the Mandapam group of islands in the Gulf of Mannar. Benthic surveys were conducted with major attack of seven coral reefs diseases with high sedimentation rate, nine species of fleshy macro-algae (*Turbinaria ornata*, *Turbinaria conaides*, *Caulerpa scalpelliformis*, *Caulerpa racemosa*, *Kappaphycus alvarezii*, *Padina gymnosphora*, *Sargassum wightii*, *Ulva reticulata* and *Calurpa lentillifera*) proliferation against major corals life forms (Acropora branching, Acropora digitate, Acropora tabulate, coral massive, coral submassive, coral foliose and coral encrusting). The results confirm that diseased corals most favor to macro-algae growth (15.27%) rather than the sedimentation covered corals (8.24 %). In the degradation of coral life forms, massive corals were more highly damaged (7.05%) than any other forms. Within a short period of time (May to September), coral coverage shrank to 17.4% from 21.9%, macro-algae increased 23.51% and the average sedimentation rate attained 77.52 mg $cm^{-2}d^{-1}$ with persisting coral reef diseases of 17.59%. The Pearson correlation showed that the coral cover decreased with increasing macro-algae growth, which was statistically significant ($r=-0.774$, $n=100$, $P<0.0005$). The proliferation of the various macro-algae *C. scalpellifrmis*, *T. ornata*, *C. racemosa*, *T. conaides*, *U. reticulata*, *S. wightii*, *K. alvarezii*, *P. gymnosphora* and *C. lentillifera* increased with percentages of 6.0, 5.8, 5.7, 4.9, 4.2, 3.7, 2.7 and 1.9, respectively. If this trend continues, the next generation of new recruit corals will undoubtedly lead to a phase shift in Gulf of Mannar corals.

Key words climate change; sedimentation; disease; proliferation; recovery; macroalgae; Mandapam; Gulf of Mannar

1 Introduction

Coral reef ecosystem is space limited and known for their precious resources. Worldwide most of the corals are declining because of increased frequency of climatic pressures coupled with other natural and anthropogenic stresses (Hughes and Connell, 1999). This includes habitat destruction, pesticide and heavy metal accumulation; nutrient loading paves way to shifts in competitive interactions, direct mortality, reproductive failure, and insufficient recruitment in coastal reefs (Richmond, 1993). Coral reef decline and subsequent recovery in Indo-Pacific regions is only 29% compared to 57% in Western Atlantic (Connell, 1997) and the Great Barrier Reef degradation is noticed at the level of 0.53% yr^{-1} during the period 1985 to 2012 (De'ath *et al*., 2012). The majority of coral reefs on the globe are facing phase shifts in terms of dominating macro-algae, corallimorph, sponge and sea urchins (Maliao *et al*., 2008; Mumby, 2009; Norstrom *et al*., 2009), whereas Caribbean waters, especially in Jamaica, are noticed with phase shift reversal (Idjadi *et al*., 2006). Phase shift phenomena can be triggered by various environmental disturbances such as diseases, predations, nutrients, hurricane, sedimentation load, reduced herbivores due to anthropogenic activities and coral bleaching. Among the disturbances coral bleaching immediately

* Corresponding author. Tel: 04144-252099
E-mail: umaradjou@gmail.com

IOP Publishing Mater. Res. Express 3 (2016) 106203 doi:10.1088/2053-1591/3/10/106203

Materials Research Express

PAPER

RECEIVED
18 August 2016

REVISED
17 September 2016

ACCEPTED FOR PUBLICATION
20 September 2016

PUBLISHED
13 October 2016

Crystal growth, perfection, linear and nonlinear optical, photoconductivity, dielectric, thermal and laser damage threshold properties of 4-methylimidazolium picrate: an interesting organic crystal for photonic and optoelectronic devices

K Rajesh[1], **A Arun**[2], **A Mani**[3,4] **and P Praveen Kumar**[4]

[1] Department of Physics, AMET University, Kanathur, India-603 112
[2] Department of Chemistry, SRM University, Ramapuram, Chennai, India-600089
[3] Department of Physics, Sri Venkateswaraa College of Technology, Sriperumbudur, India 602 105
[4] Department of Physics, Presidency College, Chennai, India- 600005

E-mail: krishjayarajesh@gmail.com

Keywords: optical materials, crystal growth, optical properties

Abstract

The 4-methylimidazolium picrate has been synthesized and characterized successfully. Single and powder x-ray diffraction studies were conducted which confirmed the crystal structure, and the value of the strain was calculated. The crystal perfection was determined by a HRXR diffractometer. The transmission spectrum exhibited a better transmittance of the crystal in the entire visible region with a lower cut-off wavelength of 209 nm. The linear absorption value was calculated by the optical limiting method. A birefringence study was also carried out. Second and third order nonlinear optical properties of the crystal were found by second harmonic generation and the z-scan technique. The crystals were also characterized by dielectric measurement and a photoconductivity analyzer to determine the dielectric property and the optical conductivity of the crystal. The laser damage threshold activity of the grown crystal was studied by a Q-switched Nd:YAG laser beam. Thermal studies established that the compound did not undergo a phase transition and was stable up to 240 °C.

1. Introduction

Organic crystals provide an excellent nonlinear optical (NLO) property due to the presence of π-bonds which satisfy the requirements in the emerging laser technology [1, 2]. Many opto-electronic and photonic industries need a stronger material for laser fabrication with the desired NLO property [3]. Organic crystals have a large NLO coefficient compared to inorganic crystals.

Crystallization of more than one component into a new compound, forming a new co-crystal, is a well-known and broad research area involving, for example, active pharmaceutical ingredients and crystal engineering [4, 5]. 4-methylimidazole is an often used pharmaceutical intermediate [6]. Picric acid is one of the stronger organic acids and is well renowned for its proton donating property. Picric acid can be easily adopted as an organic acid in the synthesis of co-crystallized complexes with other ingredients [7]. The crystal structure and hydrogen bonding of 4-methylimidazolium picrate (4-MIP) were reported in the investigation made by Xue-gang *et al* [8].

In the present investigation we focus on the crystal growth and various characterizations made on 4-MIP. Single and powder x-ray diffraction (XRD), UV–vis spectroscopy, optical limiting (OL), photoluminescence (PL) and birefringence, photoconductivity, dielectric and thermal studies are carried out and discussed. Second harmonic generation (SHG), z-scan and laser damage threshold (LDT) studies are also conducted on the crystal, and the obtained results are discussed in detail.

Indian Journal of Science and Technology, Vol 9(48), DOI: 10.17485/ijst/2016/v9i48/108970, December 2016
ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645

New Cryptography Algorithm with Fuzzy Logic for Effective Data Communication

K. GaneshKumar[1*] and D. Arivazhagan[2]

[1]IT Department, AMET University, Kanathur, Chennai - 603112, Tamil Nadu, India; ganeshsvcet@gmail.com
[2]Department of E-Governance, AMET University, Kanathur, Chennai - 603112, Tamil Nadu, India; arivazhagand@hotmail.com

Abstract

In this communicative world, people forget to care about the security when the data communication gets the importance than the privacy most of the time. There the data theft takes place effortlessly. Many methodologies have been devised for making the effective communication either over the internet or intranet. However, the hackers enrich themselves than the new technologies whenever are launched. As need arises for cultivate the security key generation while secure data communication has to be ensured, we propose a new cryptography algorithm along with the fuzzy logic through this paper that materializes the secure communication possible. Firstly, we observed the flaw that causes for hacking effortlessly by the intruder during the data transmission over the network. Then the evaluation part could be done with the same context without losing data because of this proposed algorithm. This algorithm concentrates on image and text data encryption using fuzzy logic and on secured sharing theme which provides highly authenticated data transferring. The existing security algorithms had nod in many ways only for the secure data transmission rather than the complexity in which they have when need to be executed. Henceforth the aspirants who want to have the communication have to spend more time than the actual. Obviously the precious algorithms should have less processing time and high secure in nature. With keeps it as a main aspect the New Cryptography algorithm with fuzzy logic is proposed and has low process time and high security logics using various key for encryption and decryption. The results which produced by this proposed algorithm have been compared with exist algorithms and finally could arrive the conclusion that the proposed is highly effective in security aspects and needs minimum amount of time to be executed.

Keywords: Cryptography, Fuzzy Logic, Private Key, Public Key, RSA Algorithm, Security Key

1. Introduction

Everyone using computers all around the world irrespective of age and qualifications that not only for commercial but also for personal purposes[1,2]. Even the new born babies may seek their tablets as their very first activity in this world in near future. Technology doesn't have the limit even after gone to appreciable high within the last six to seven decades. As technology improves, the crime also increases in all sectors. In order to avoid this kind of crimes users had to meticulously keep active the traditional methods such as stopping additional services, updating the antivirus[3] in frequent intervals, providing the security by installing firewalls and concentrating on parental controls[4,5]. However, data confidentiality is not guaranteed and sometimes data could be stolen even in traditional computer security. There is an alternate way of solving this kind of cyber-crime issues[6] which is known as cryptography technology[7]. This is the powerful technology which can take control of both nodes and mediums and doesn't allow the hacker or theft to steal the information without the security key. This Cryptography technology plays a vital role both on sender and receiver sides while encrypt and decrypts the data as well. There are lot of cryptography algorithms exist for encrypting and decrypting the data during the data transmissions in last

*Author for correspondence

Journal of ELECTRONIC MATERIALS
DOI: 10.1007/s11664-016-4798-5

Growth, Optical, Dielectric and Ferroelectric Properties of Non-Linear Optical Single Crystal: Glycine-Phthalic Acid

SAGADEVAN SURESH[1,2]

1.—Department of Physics, AMET University, Kanathur, Chennai 603112, India. 2.—e-mail: drsureshphysics@gmail.com

Single crystals of glycine-phthalic acid (GPA) were grown by slow evaporation process using aqueous solution. X-ray diffraction analysis was used to examine its cell structure and it was found that the GPA crystal corresponded to the orthorhombic system. To identify absorption range and cut-off wavelength for the GPA crystal, UV-visible spectrum was recorded. UV-visible spectroscopy was used to study the optical constants such as the refractive index, the extinction coefficient, electrical susceptibility, and optical conductivity. As a function of different frequencies and temperatures, the dielectric constant and the dielectric loss were examined. The electrical properties like plasma energy, Penn gap, Fermi energy, and polarizability were determined for the analysis of the second harmonic generation (SHG). Using the Kurtz powder technique, the SHG of the GPA crystal was studied. Investigations relating to hysteresis were carried out to ascertain the ferroelectric nature of the material.

Key words: Solution growth technique, NLO, SHG, XRD, UV-Visible spectroscopy, ferroelectric material

INTRODUCTION

The possibility of wide applications of non-linear optical (NLO) materials in the fast-growing and interesting fields of photonics, fiber optic communications, frequency doubling, and optical signal processing is attracting the attention of researchers.[1,2] For the development of laser systems, the key step is the efficient optical frequency conversion of NLO crystals. These systems are extremely important as broad range tuneable sources of coherent illumination in the ultraviolet, visible and near-infrared spectral regions. The present work aims to design a new material that can be considered as a second-order optical method and can have strong interaction with the oscillating electric field of light.[3] Active research is much required to produce optical devices for specific efficiencies or devices with improved performance, and it can be accomplished by the selection of suitable organic non-linear optical materials.[4,5] The amino acids are known as the finest organic materials which play a vital role in the field of non-linear optical crystal growth. The natural amino acids contain a donor NH_2 and an acceptor COOH and hence exhibit individual non-linear optical properties.[6] The fact that amino acids play an important role in the field of non-linear optical crystal growth cannot be gainsaid. The non-linear optical effect has been observed from a great number of individual natural amino acids. For the optical second harmonic generation (SHG), a greater promise is found in the complex of amino acids. Presently, the demand is for not compromising on the quality and size of the crystals but to achieve the rapid growth in a shorter period of time. The deviation of physical, optical, and electrical properties of these materials is important for the development of novel NLO materials and is achieved by adding functional groups or by including dopants for different/modified applications. Dopants analysis is useful in the enhancement of growth-promoting factors such as growth rate and other convenient physical properties like optical transparency, SHG efficiency, laser damage threshold (LDT), etc.

(Received December 20, 2015; accepted July 8, 2016)

Published online: 28 July 2016

J Mater Sci: Mater Electron
DOI 10.1007/s10854-016-5651-6

Structural and optical absorption studies of cobalt substituted strontium ferrites, $SrCo_xFe_{12-x}O_{19}$ (x = 0.1, 0.2 and 0.3)

K. Alamelu Mangai[1] · K. Tamizh Selvi[1] · M. Priya[2] · M. Rathnakumari[3] · P. Sureshkumar[3] · Suresh Sagadevan[4]

Received: 19 July 2016 / Accepted: 29 August 2016

Abstract Cobalt substituted strontium ferrites $SrCo_xFe_{12-x}O_{19}$ (x = 0.1, 0.2 and 0.3) were synthesized via sol–gel method and the dried gel obtained was annealed at 800 °C. The powder X-ray diffraction studies helped in the determination of the crystallite size that measured ≈ 12–14 nm. The optical properties of the powdered nanoparticles were determined by means of the UV–Vis absorption spectra of their dispersed solutions in liquid media. Despite these measurements, it was difficult to determine their band gap (E_g) precisely. However, the Kubelka–Munk treatment on the diffuse reflectance spectra of the powdered nanoparticles was used in order to extract their E_g unambiguously. The Co substituted strontium hexaferrites are used for optical studies. The energy band gap for all the ferrite compositions was found to be ≈ 1.46–1.78 eV. The study made on the dielectric behaviour of the substituted $SrFe_{12}O_{19}$ is also discussed in this paper.

✉ M. Priya
priyamurugasen15@gmail.com

[1] Department of Physics, VelTech HighTech Engineering College, Avadi, Chennai, India

[2] Department of Physics, Saveetha Engineering College, Chennai, India

[3] Department of Physics, Velammal Engineering College, Surapet, Chennai, India

[4] Department of Physics, AMET University, Chennai, India

1 Introduction

The energy gap (E_g) is an important feature of semiconductors and it determines their applications in optoelectronics [1]. This wide band gap can be altered if the particle size of the system lies in the nanometric region. The large band gap coupled with its large excitonic binding energy has made it a potential candidate in light emitting diodes (LEDs) and LASERS in the ultraviolet region [1, 2]. Optical absorption edge at the ultraviolet end of the UV–Visible spectrum gives more insight into the band gap enlargement of nanorods and nanotubes due to quantum confinement [3, 4]. The exclusive properties of ferrites make them appropriate for different applications [5–10]. Inorganic hybrid nanocomposites have been widely studied due to their enhanced structural and optical properties [11–15]. In this research, we have proposed a simple process of sol–gel route for fabricating $SrCo_xFe_{12-x}O_{19}$ (x = 0.1, 0.2 and 0.3) nanostructure using strontium nitrate, cobalt nitrate, and iron nitrate as precursors. Controlled synthesis of nanostructure ferrites is important because of their potential applications [16–19]. Different methods have been used for the preparation of nanosized hexaferrites, [19–22]. Different techniques used for the synthesis of ferrites have the problem of poor compositional control which could be overcome by sol–gel processing. FTIR and UV–Vis diffuse reflectance spectroscopy studies of the sol–gel route synthesized nano-structure $SrCo_xFe_{12-x}O_{19}$ (x = 0.1, 0.2 and 0.3) have not been reported much. Therefore in this study we have made modifications in the synthesis of the nanosized $SrCo_xFe_{12-x}O_{19}$ (x = 0.1, 0.2 and 0.3) and characterized them by using X-ray diffraction (XRD) and field emission scanning electron microscopy (SEM). Fourier transform infrared (FTIR) spectroscopy and UV–Vis diffuse reflectance spectroscopy (UV–Vis DRS) have been employed for studying the vibrational information and band gap properties.

Published online: 01 September 2016