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25. Optimal Decision Making for the Prediction of Diabetic Retinopathy in Type 2 Diabetes Mellitus Patients

Faiz Noor Khan Yusufi, Nausheen Hashmi, Aquil Ahmed and Jamal Ahmad

Editor(s)

Biography

Irfan Ali received his B.Sc., M.Sc., M.Phil., and Ph.D. degrees from Aligarh Muslim University, Aligarh. He is currently working as an Assistant Professor with the Department of Statistics and Operations Research, A.M.U., Aligarh. His research interests include applied statistics and optimization. He has published more than 80 research articles in reputed journals and serves as a reviewer for several journals. He has delivered invited lectures in several universities and Institutions. He was awarded with Post Graduate Merit Scholarship during his M.Sc. (statistics) and the UGC-BSR Scholarship during his Ph.D. (statistics).

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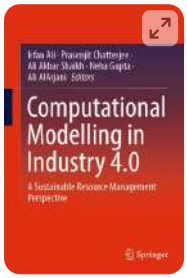

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Advances in Heat Transfer

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Chapter Three - Advances in nanofluid flow,heat, and mass transfer at moving/stretching surfaces

Kuppalapalle Vajravelu [a], John Patrick Abraham [b], Swati Mukhopadhyay [c], P. Lakshminarayana [d]

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Abstract

This book chapter is both a review of the current state-of-the-art and a report on future areas of research. It focuses on nanofluid flow, heat, and mass transfer due to moving/stretching surfaces. This chapter contains five sections; the first section provides details about the nanofluids, hybrid nanofluids, and advancements in their utilization. In the second section, non-Newtonian nanofluid flow past an unsteady stretching sheet is analyzed in detail along with the consequences of an externally applied magnetic field,

Chapter

Statistical design in accelerated downstream processing

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ABSTRACT

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Oxidative Stress in *Entamoeba histolytica*

| Chapter | First Online: 27 October 2019

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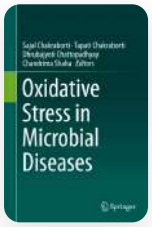

Oxidative Stress in Microbial Diseases

Somasri Dam, Pinaki Biswas & Raktim Ghosh

Abstract

Entamoeba histolytica is a human pathogen, responsible for invasive amoebiasis and dysentery. This chapter aims to describe the effect of various stresses especially oxidative and nitrosative stress on this organism. This parasite is subjected to several types of stress throughout its life cycle and also during the invasion of human tissues as a result of host's response to the infection. For successful infection, it must produce an adaptive response against host defense mechanisms. *E. histolytica* is microaerophilic, but during tissue invasion, it is exposed to high oxygen content in well-perfused tissues. This parasite has its own antioxidant strategy to protect itself against reactive oxygen and nitrogen species generated by both host and parasite. *E. histolytica* doesn't have most of the antioxidant defense mechanisms such as glutathione peroxidase, glutathione reductase, and catalase. Instead, it manages the antioxidant components from engulfed

and EhNO. Later on, H_2O_2 produces H_2O by EhPrx which is reduced by Eh34 or Trx. Fd can act as an alternative source of electron to facilitate the reduction of O_2 to H_2O without ROS generation via FDP system. FDP enzyme system can also detoxify the NO·generated by the parasite or from host immune response. Reduced Trx is converted to its oxidized form by TrxR through NADPH oxidation. EhSOD works to clean the harmful intracellular O_2^- by ORP. EhRbr with association of NROR protect mitosomes by converting H_2O_2 into H_2O. ISF and HCP have potential antioxidant capacity. *E. histolytica* can also decrease the redox potential of extracellular environment through the trans-PMET.

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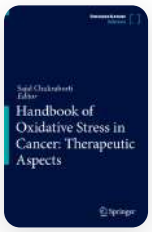

Handbook of Oxidative Stress in Cancer: Therapeutic Aspects

Pinaki Biswas, Suchetana Pal, Moubonny Das & Somasri Dam

Abstract

Within the metaorganisms, cross-communication between commensal organisms and the host is crucial for the maintenance of physiological homeostasis. At times, microbiota becomes accountable for breaching homeostasis by creating a microenvironment favoring uncontrolled cell growth. Chronic infection and inflammation act as inciting factors for reactive oxygen species generation promoting damage to DNA, proteins, and lipids. Oxidative stress activates a variety of transcription factors that in turn control the expression of several inflammatory cytokines and chemokines. Consecutive changes

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Chapter 4. Utility of Ultrasound Elastography in Detection of Liver Disease in Areca Nut Habitual

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Chapter 5. Efficiency Evaluation of Health Services of Selected Countries during the COVID-19 Pandemic

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Chapter 7. Ibuprofen: Uses, Mechanisms of Action and Clinical Outcomes

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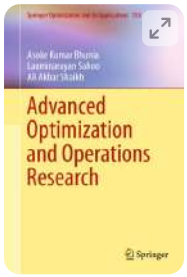
Chapter 8. Limb-Girdle Muscular Dystrophy: A Review

Nermina Nakas
Executive Director, Neuroscience and Rare Disease, Medical and Scientific Management, Clinical Solutions, Syneos Health®, Morrisville, North Carolina USA



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Phospholipases in Physiology and Pathology

Volume 7, 2023, Pages 9-33

Chapter 2 - Pathological aspects of microbial phospholipases

Raktim Ghosh *, Suchetana Pal *, Subhasish Sarkar, Somasri Dam

Department of Microbiology, The University of Burdwan, Burdwan, West Bengal, India

Available online 18 August 2023, Version of Record 18 August 2023.

What do these dates mean?

Abstract

Phospholipases are a ubiquitous group of enzymes that break down phospholipids into fatty acids and other compounds, and play crucial roles in several biochemical processes and intracellular signaling pathways. Microbial phospholipases are implicated to be associated with the pathogenesis of numerous diseases. These enzymes may act directly on the host cell membrane and cause cell damage by membrane destruction or by interfering with the host's internal signal transduction systems. This chapter describes the pathophysiological roles of phospholipases in the pathogenesis of various diseases caused by bacteria, fungi, and protozoa. Understanding the biological role of microbial phospholipases and the development of inhibitors for these enzymes are absolutely necessary to generate potential therapeutics and vaccines. This will ultimately reduce the consequences of associated diseases in both humans and animals.

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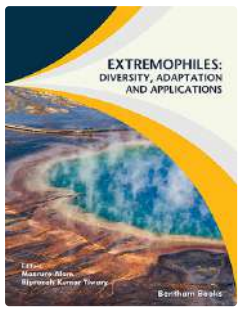
* RG and SP contributed equally in preparing the chapter.



Applications of Extremophiles

Author(s): Urmimala Sen and Subhra Kanti Mukhopadhyay * .

Pp: 395-417 (23)

DOI: 10.2174/9789815080353122010018

Abstract

Extremophiles are organisms that can survive in harsh environmental conditions such as varying ranges of temperature, pH, high levels of salinity, extreme pressure and high doses of radiation. They are distributed throughout the Earth's surface and water bodies. They are classified on the basis of their habitats and extreme conditions they inhabit, like oligotrophs, thermophiles, psychrophiles, halophiles, acidophiles, alkaliphiles, piezophiles and radiophiles. Extremophiles have a huge impact on human life. Enzymes obtained from them are nowadays used in industrial microbiology, agriculture, pharmaceuticals and medical diagnostics, bioremediation, and in many more fields. With enormous commercial benefits and advanced scientific techniques, researchers are investigating extremophiles for a better understanding of their metabolism, and survival strategies for newer applications. This chapter focuses on applications of different types of extremophiles in industry, scientific research, medical science, and other fields.

Keywords: Acidophiles, Alkaliphiles, Bacteriorhodopsin, Cold-active enzymes, Compatible solutes, Extremophiles, Extremozymes, Halophiles, Heavy-metal resistance, Industrial applications, Mycosporine-like amino acids, Oligotrophs, PGPR, Piezophiles, Polyextermophile, Poly-β hydroxyl alkanoates, Psychrophiles, Radiophiles, Thermophiles.

Microbial Metabolism of Organophosphates: Key for Developing Smart Bioremediation Process of Next Generation

| Chapter | First Online: 22 March 2020

| pp 361–410 | Cite this chapter

Microbial Technology for Health and Environment

Santanu Pailan, Kriti Sengupta & Pradipta Saha

Part of the book series: Microorganisms for Sustainability ((MICRO,volume 22))

Abstract

Currently organophosphate compounds constitute one of the largest families of chemical compounds that are used for pest control, mainly for better crop yield worldwide. Due to their toxicity, persistence, and adverse effects, some organophosphates (like parathion and methyl parathion) were classified and registered as extremely hazardous by the World Health Organization (WHO) and US EPA (US Environmental Protection agency) and have been banned in many countries. Some of the hydrolysis intermediates (such as 4-

Serial No. 425

Authors are grateful to SERB, New Delhi, for providing fund to carry out work on organophosphate degradation and to the University of Burdwan, Burdwan, West Bengal.

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Santanu Pailan, Kriti Sengupta & Pradipta Saha

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Microbial Technology for Health and Environment. Microorganisms for Sustainability, vol 22. Springer, Singapore. https://doi.org/10.1007/978-981-15-2679-4_14

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Microbial Diversity in Hotspots

2022, Pages 177-205

Chapter 10 - Bacterial diversity from Garampani warm spring, Assam

Joyasree Das [1], Pradipta Saha [2], Srinivasan Krishnamurthi [1]

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Abstract

Prokaryotic organisms constitute one of the major components of biological diversity but in spite of their immense importance, they have not been given enough attention because of their invisibility. Moreover, many lines of evidence suggest that most of them (more than 99%) are not amenable to cultivation. In the present study, bacterial diversity of water of a warm spring located in Assam, a state in the North East of India, was analyzed using a combination of media conditions including nutritionally poor, that is, oligotrophic media. The bacterial representatives were mainly placed in four phyla, namely "Bacteroidetes," "*Deinococcus-Thermus*," Firmicutes, and Proteobacteria (and classes). Using this approach, three new genera (*Aquimonas*, *Emticicia*, *Fontibacillus*) and three novel species were discovered and few more promising candidates for novel taxa await description. Media biasness was observed with a few novel taxa and species of *Emticicia*, Flavobacterium, *Idonella, Niveibacterium, Rheinheimera,* Deinococcus, Pseudomonas, *Chitinimonas, Curvibacter*, recovered only from the nutritionally poor medium, while taxa belonging to *Falsibacillus*, *Aquimonas,* Azoarcus, Comamonas, *Pseuaeromonas,* Paenibacillus, *Fontibacillus, Rubrivivax*, and Thauera grew only on nutritionally rich media. Interestingly limited sequencing based on culture-independent 16S rRNA gene-based cloning approach revealed the presence of a large number of

Cyanobacterial sequences and few Proteobacteria clones with a majority of them showing low similarity with cultivated representatives.

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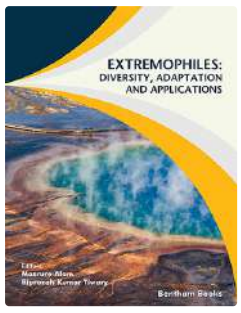

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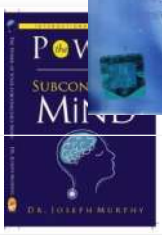

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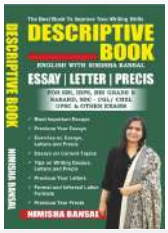

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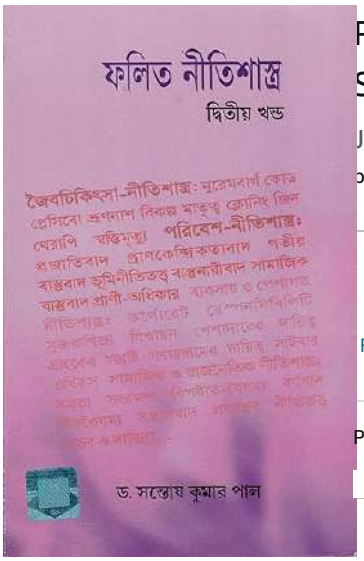

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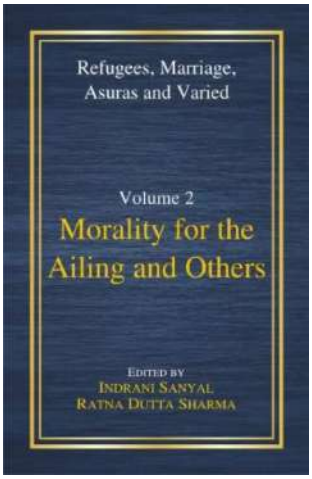

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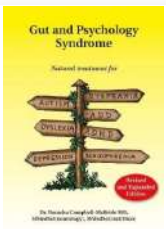

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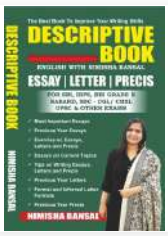

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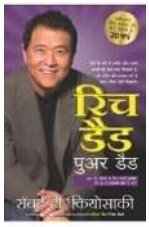

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Inorganic Micro and Nanostructures

2019, Pages 81-117

Chapter 3 - Structural interpretation, microstructure characterization, mechanical properties, and cytocompatibility study of pure and doped carbonated nanocrystalline hydroxyapatites synthesized by mechanical alloying

Sushovan Lala, Swapan Kumar Pradhan

Materials Science Division, Department of Physics, The University of Burdwan, Burdwan, India

Available online 29 March 2019, Version of Record 29 March 2019.

https://doi.org/10.1016/B978-0-08-102814-8.00004-4

Abstract

Nanocrystalline biocompatible undoped and Mn-, Mg-, and Zn-doped carbonated hydroxyapatite (HAp) powders have been synthesized via mechanical alloying. A-type carbonation in HAp is confirmed by FTIR analysis. Microstructure characterization in terms of lattice imperfections and phase quantification of the samples are made by analyzing XRD patterns employing Rietveld's method. Microstructure characterization by

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Photonics: A Dream of Modern Technology

By *Sourangshu Mukhopadhyay*, *Shuvra Dey*, *Subhendu Saha*

Book Photonics and Fiber Optics

Edition	1st Edition
First Published	2019
Imprint	CRC Press
Pages	28
eBook ISBN	9780429026584

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ABSTRACT

Optics is established as a potential replacement and alternative of electronic signal in global communication scenarios and in data processing technology because it carries many inherent advantages over its electronic counterpart. These include parallelism, speed, reliability, etc., which are the in-built characters of photons. It is proved that billions of data can be carried by photons at a time. Simultaneously, they can go to the desired destination of millions kilometers apart at a shortest possible time without any difficulty and with a high degree of reliability. They also keep their identity to preserve

the high value of signal-to-noise ratio (SNR). Similarly, the bit error problem is also reduced significantly. The future of communication is believed to be as all photonic communication to exploit multi-level advantages in data transport.

In this chapter, the authors discuss some modern application areas of photonics. The areas are quantum computation, optical soliton, squeezed state of light, photon in quantum cryptography, photon in nano-science and in high-end computation.

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RESEARCH ARTICLE | NOVEMBER 05 2020

Frequency dependent dielectric properties of silver doped hydroxyapatite nanoparticles

Tuli Chatterjee; Amit Kumar Das; Swapan Kumar Pradhan; Ajit Kumar Meikap

— Author & Article Information

a) Corresponding author: meikapnitd@yahoo.com

AIP Conf. Proc. 2265, 030434 (2020)

https://doi.org/10.1063/5.0017392

Silver doped hydroxyapatite (Ag-HAp (2 mol.%)) nanoparticles of crystallite size 43 nm have been synthesized by employing facile hydrothermal method. The structural, morphological, compositional and electrical characteristics have been studied. The detail dielectric properties at and above room temperature shows a high permittivity value of the synthesized material with a very low dielectric loss which is very much promising for future electronic applications. The high temperature real dielectric response curves are least square fitted with modified Cole-Cole equation to observe the agreement between theoretical and experimental values. The correlated barrier hopping (CBH) model prevails the charge transport mechanism within Ag-HAp on application of external electric field. The plot of frequency dependent imaginary electric modulus of our material shows deviation from ideal Debye-type relaxation nature.

Topics

Electrical properties and parameters, Dielectric materials, Dielectric properties, Nanoparticle, Minerals, Transition metals, Charge transport, Chemical synthesis, Doping, Public policy and governance

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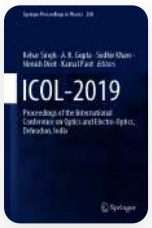
Implementation of Quantum Optical Phase Shift Gate Adopting Multi-passing Technique in Lithium Niobate Based Electro-Optic Crystal

| Conference paper | First Online: 02 March 2021

| pp 687–690 | Cite this conference paper



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Minakshi Mandal & Sourangshu Mukhopadhyay

Part of the book series: Springer Proceedings in Physics ((volume 258))

Abstract

Quantum phase shift gate operates ordinarily on a single qubit. Here the authors propose a new scheme of implementation of quantum optical phase shift gate adopting multi-passing technique in lithium niobate ($LiNbO_3$) based electro-optic crystal. By using the multi-passing technique the phase operation can be done by very low voltage.

The authors acknowledge University Grants Commission (UGC) for the financial support for extending a research fellowship to Minakshi Mandal.

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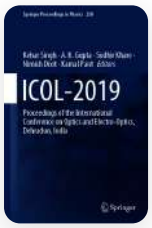

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Abstract

Propagation of light through a linear-electro optic Pockels material in presence of an external electric field generates a controlled phase shift within it. Similarly Kerr type of electro-optic material causes intensity dependent phase variation. These interesting phenomena of electro-optic material one used in optical communication. Our proposed idea is how one can easily control the phase of an outgoing light wave by controlling suitable biasing voltage as well as the intensity of the input light wave jointly.

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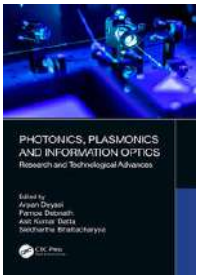

Investigation on Some Fast Optical/Opto-Electronic Switching Systems for Implementing Different Modulation Schemes

By Minakshi Mandal (/search?contributorName=Minakshi Mandal&contributorRole=author&redirectFromPDP=true&context=ubx), Suranjan Lakshan (/search?contributorName=Suranjan Lakshan&contributorRole=author&redirectFromPDP=true&context=ubx), Debashri Saha (/search?contributorName=Debashri Saha&contributorRole=author&redirectFromPDP=true&context=ubx), Agnijita Chatterjee (/search?contributorName=Agnijita Chatterjee&contributorRole=author&redirectFromPDP=true&context=ubx), Sourangshu Mukhopadhyay (/search?contributorName=Sourangshu Mukhopadhyay&contributorRole=author&redirectFromPDP=true&context=ubx)

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ABSTRACT

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A new scheme of conducting amplitude modulation with KDP crystal using multiple-number of message signals on a single carrier light beam followed by different analyzer

Minakshi Mandal and Sourangshu Mukhopadhyay
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Abstract

Electro-optic Modulators have several applications like data transmission, data processing, all-optical switches in modern communication system. Non-linear materials like lithium niobate ($LiNbO_3$), potassium dihydrogen phosphate (KDP), lithium tantalate ($LiTaO_3$) are basically used to design the Pockels type of electro-optic modulator. Using the non-linear property of the electro-optic material with the application of suitable biasing voltage, amplitude modulation, phase modulation, polarization modulation, frequency modulation of carrier light signal are conducted. Here the authors proposed a new scheme where the amplitude modulation with KDP crystal is conducted by using multiple number of message signals on a single carrier light beam.

INTRODUCTION

Electro-optic materials are established as high speed electro-optic devices due to their non-linear optical property. Amplitude modulation, phase modulation, polarization modulation, frequency modulation etc. are occurred due this non-linear property of the electro-optic material which leads to develop the high speed communication devices [1]. Sharp variation of transmission factor of KDP crystal by super parabolic biasing voltage is derived using the amplitude modulation scheme[2]. An investigation is done to achieve the highest phase difference between the orthogonal components of light in lithium niobate based electro-optic system [3]. Increase of sideband powers in parallel phase modulation is done in lithium niobate based electro-optic system [4]. Highest Transmission Factor is obtained in Case of KDP Based Electro-Optic Crystal by the Adjustment of Suitable Biasing Voltage and Number of Feedback Passing [5]. A systematic and quantitative analysis of residual amplitude modulation is derived from the birefringence character of the electro-optic crystal [6]. In this paper, the author conducted a new scheme of amplitude modulation with KDP crystal where multiple number of message signals are used in a single carrier light beam.
Here the novelty of the proposed method is that putting the analyzer in different suitable positions, one can obtain output modulated beam containing different message signals.

AMPLITUDE MODULATION BY ELECTRO-OPTIC MODULATOR

Amplitude modulation is used to transmit information through radio carrier wave in electronic communication system. Phase and polarization states are the fundamental modulation taken place in the electro-optic modulator. These modulations lead to the amplitude modulation in desired conditions. When a light polarized in x' direction passes through the KDP crystal of length (l) along Z direction with the application of an external electric field (E) parallel to Z direction (Fig. 1), then the refractive index of the material is expressed as $n_{x'} = n_0 - \frac{1}{2}n_0^3 r_{63} El$. Now the output light signal is expressed as $E_{x'}(l) = E_{x'}(0) \exp i\,(\,\omega t - kn_0 l + \frac{1}{2}kn_0^3 r_{63} El)$.

When the polarization direction of the light beam is changed to y' direction, then the refractive index of the material is expressed as, $n_{y'} = n_0 + \frac{1}{2}n_0^3 r_{63} El$. Now the output light signal is expressed as $E_{y'}(l) = E_{y'}(0) \exp i\,(\,\omega t - kn_0 l + \frac{1}{2}kn_0^3 r_{63} El)$. Now these two light beams are taken from a single light source, polarized in 45 to both x' and y' and passes through the KDP crystal, then output signal passes through an analyzer which is perpendicular to input polarization state, then the output signal emerging from the analyzer is an amplitude modulated output signal. The expression of the amplitude modulated signal is

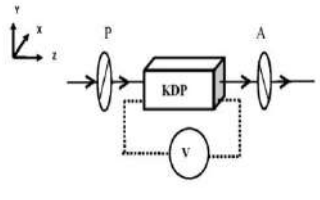

Figure 1. Amplitude Modulation in KDP Crystal

$E'(l) = \frac{A}{2}[\exp i\,(\,\omega t - kn_0 l + \frac{1}{2}kn_0^3 r_{63} V) - \exp i\,(\,\omega t - kn_0 l - \frac{1}{2}kn_0^3 r_{63} V)$; [where $V = El$]

The intensity of the amplitude modulated signal is expressed as

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An all-optical scheme for developing a programmable and integrated Pauli X, Y & Z gate based logic system using phase and frequency encoding principles

Snigdha Hazra and Sourangshu Mukhopadhyay
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Abstract

The heart of a quantum computer is made of quantum logic blocks that consists of a programmed sequence of quantum logic gates. In this paper an all-optical scheme for developing a programmable and integrated Pauli X, Y & Z gate based logic system is proposed. The system is developed by using phase encoding and frequency encoding techniques jointly. Since the proposed scheme is all-optical in nature, the system exhibits high degree of parallelism and high speed of operation.

INTRODUCTION

Quantum behavior of light plays a potential and significant role in computation and communication. Quantum logic is based on the principles of quantum mechanics. The essential components of a quantum computer are quantum logic gates that operate on qubits. High degree of parallelism, enormous storage capacity, superfast speed of operation, low noise, no cross-talk, data security etc. can be achieved by quantum computation. Various quantum logic gates such as Pauli X, Y, Z gates, SRZ gate, SRCZ gate, NOT gate, CNOT gate, Fredkin gate, Hadamard gate, Toffoli gate etc. were implemented in last few years by several ways. Optics is found as a very suitable and potential candidate in quantum computation. In quantum computer, the basic unit of information is qubit or quantum bits. Different physical properties of light (Intensity, Polarization, Phase, Frequency etc.) are used to encode the bits. Several all-optical integrated logic systems are developed earlier using different encoding techniques. All-optical integrated Pauli X, Y & Z gates were implemented using frequency encoding technique by Sarkar et.al.[1].The integrated square root of Pauli Z (SRZ) gate were also developed using polarization and phase encoding techniques jointly[2]. Integrated Pauli X, Y & Z quantum gates with optical switches were also implemented previously[3].

In this paper, an all-optical scheme for developing a programmable and integrated Pauli X, Y & Z gate based logic system using phase and frequency encoding principles of light is proposed. Pauli X, Y & Z gates are very much advantageous in the world of quantum computing from application point of view. They act on single qubit states. The general qubit states can be represented as, $|\Psi> = a|0> + b|1>$ Where a and b are amplitude coefficients.

The states $|0>$ and $|1>$ are represented by 2×1 column matrices.

$$|0> = \begin{pmatrix}1\\0\end{pmatrix} \quad \& \quad |1> = \begin{pmatrix}0\\1\end{pmatrix}$$

The Pauli-X gate is represented by Pauli X matrix.

$$X = \begin{pmatrix}0 & 1\\1 & 0\end{pmatrix}$$

Hence, when it operates on $|0>$ and $|1>$ respectively, we get,

$$\begin{pmatrix}0 & 1\\1 & 0\end{pmatrix}\begin{pmatrix}1\\0\end{pmatrix} = \begin{pmatrix}0\\1\end{pmatrix} \qquad \begin{pmatrix}0 & 1\\1 & 0\end{pmatrix}\begin{pmatrix}0\\1\end{pmatrix} = \begin{pmatrix}1\\0\end{pmatrix}$$

This shows that the Pauli-X gate acts as a NOT gate. The gate is reversible in nature as we get back the original state by repeating the operation.

Pauli-Y gate is represented by Pauli Y matrix.

$$Y = \begin{pmatrix}0 & -i\\i & 0\end{pmatrix}$$

Hence, when it operates on $|0>$ and $|1>$ respectively, we get,

$$\begin{pmatrix}0 & -i\\i & 0\end{pmatrix}\begin{pmatrix}1\\0\end{pmatrix} = \begin{pmatrix}0\\i\end{pmatrix} \qquad \begin{pmatrix}0 & -i\\i & 0\end{pmatrix}\begin{pmatrix}0\\1\end{pmatrix} = \begin{pmatrix}-i\\0\end{pmatrix}$$

Again,

$$\begin{pmatrix}0 & -i\\i & 0\end{pmatrix}\begin{pmatrix}0\\i\end{pmatrix} = \begin{pmatrix}1\\0\end{pmatrix} \qquad \begin{pmatrix}0 & -i\\i & 0\end{pmatrix}\begin{pmatrix}-i\\0\end{pmatrix} = \begin{pmatrix}0\\1\end{pmatrix}$$

Pauli-Y gate also follows reversible character. By repeating the operation, the original state is obtained.

Pauli-Z gate is represented by Pauli-Z matrix.

$$Z = \begin{pmatrix}1 & 0\\0 & -1\end{pmatrix}$$

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An alternative proposal for implementation of quantum optical oscillator with tristate Pauli-Z gate

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Abstract

In quantum optical computation, a pair of states are required to be appeared alternatively at the output of a quantum optical oscillator at a certain time interval. A two-state quantum optical oscillator has been developed earlier with oscillating intensity of light. In this paper authors have a new proposal for implementation of quantum optical oscillator using tristate Pauli-Z quantum gate, with oscillating phase of the light signal.

INTRODUCTION

An oscillator can deliver output signal even without any external input signal. It can produce periodic wave of a desired frequency at its output. In quantum optical computing, light is used as the signal carrier [1]. So, at the output of a quantum optical oscillator circuit one can expect the oscillation of one of the parameters of light. These parameters can be intensity, phase, etc. Intensity oscillation circuit [2] has been proposed earlier by Shuvra Dey et al. In this paper authors are going to present a new proposal for implementation of quantum oscillator circuit with tristate Pauli-Z logic gate [3]. Here, the oscillating parameter is the phase of the light signal. All operations are done by using intensity and phase modulation of light signals [4]. As the phase of light has quantum behaviour, at the output of the oscillator the quantum nature of the states will be maintained.

TRISTATE PAULI-Z GATE AND ITS OPERATION

There are two different circuits corresponding to tristate Pauli-Z gate [3]. One of those is used here to design tristate oscillator circuit. The circuit diagram of tristate Pauli-Z gate is shown in Figure 1.

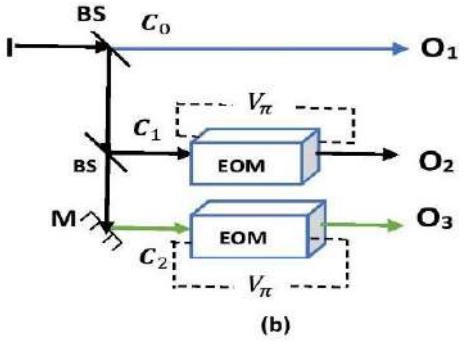

Figure1. Circuit diagram of Pauli-Z gate.

The circuit of Pauli-Z gate gives the output $\begin{pmatrix} C_0 \\ -C_1 \\ -C_2 \end{pmatrix}$ for the input $\begin{pmatrix} C_0 \\ C_1 \\ C_2 \end{pmatrix}$.

The gate matrix corresponding to this circuit is Z = $\begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{pmatrix}$.

PROPOSED SCHEME FOR IMPLEMENTATION OF PAULI-Z GATE BASED TRISTATE OSCILLATOR WITH LIGHT

The optical circuit diagram for quantum optical oscillator circuit using tristate Pauli-Z gate is shown in Figure 2. The input signals are C_0, C_1 and C_2 and the corresponding outputs are taken at O_1, O_2 and O_3 respectively. Feedbacks to the inputs are taken from respective outputs in all three channels via EDFAs (Erbium-doped Fibre Amplifier) and electro-optical modulators (EOMs). Signal is applied to the inputs for once and then they are removed to receive the oscillatory operations.

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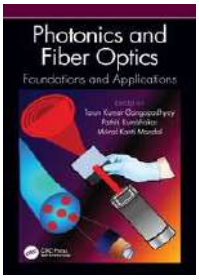

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By Udit Chatterjee (/search?contributorName=Udit Chatterjee&contributorRole=author&redirectFromPDP=true&context=ubx)

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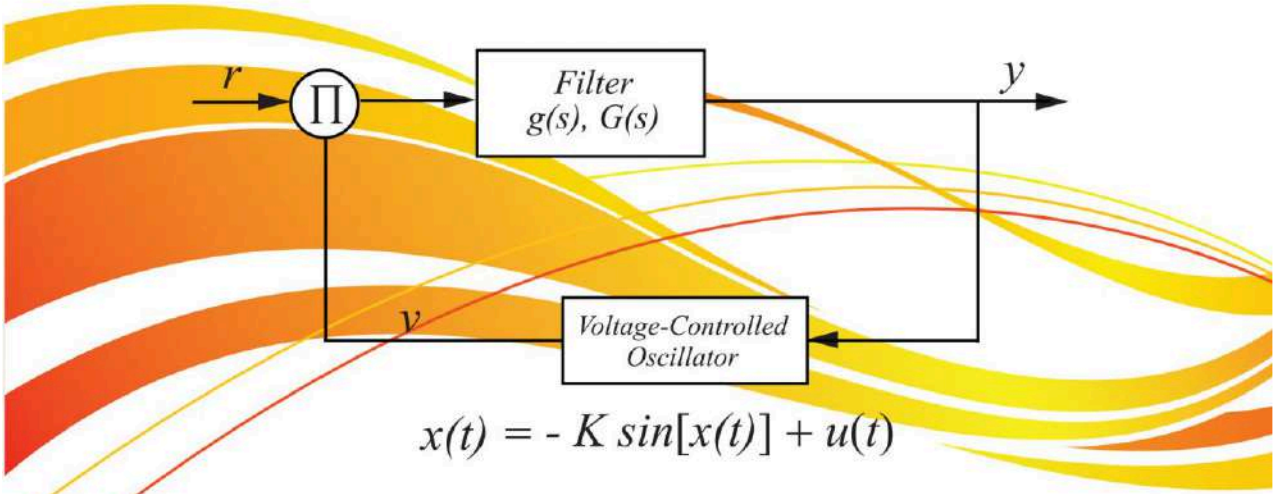
ELECTRICAL ENGINEERING DEVELOPMENTS

Phase-Locked Loops

Structure, Functions and Applications



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The historic account of the Phase-Locked Loops can be traced back from the idea of designing an electromechanical system with the objective of controlling the oscillation of the pendulum of the bell Great George. The method is to contrast the phase of pendulum and the incoming telegraph signal phase using the electromechanical system. That generates the correction signal varying the pendulum oscillation. The idea was conceived as well as implemented by David Robertson, Professor of Electrical Engineering at the University of Bristol.

The term Phase-Locked Loop was coined to this technique by later Researchers in 1932. Professor David Robertson is credited to the Phase-Locked Loop for pioneering the technique. In general setting, the Phase-Locked Loops are for synchronization purposes. The phase locked loops perspective hinges on the analysis, functions and applications.

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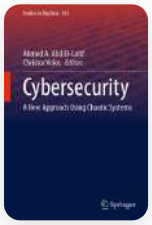

Cybersecurity

Tanmoy Banerjee & Biswabibek Bandyopadhyay

Part of the book series: Studies in Big Data ((SBD,volume 102))

Abstract

Quantum communication has been identified as the most secured technique of future communication systems. Its security is directly tied up to the fundamental laws of quantum mechanics that never fail. The success of quantum communication hinges on the notion of oscillations and synchronization in the quantum regime. In this chapter, we discuss self-sustained oscillations and their synchronizations in the quantum regime. Unlike classical oscillations, quantum oscillations are bounded by several constraints of quantum mechanics. For example, although a prominent phase trajectory is possible in

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Metal Oxide Heterostructured Nanocomposites for Wastewater Treatment

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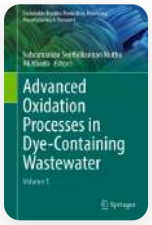

Advanced Oxidation Processes in Dye-Containing Wastewater

M. Mondal, M. Ghosh, H. Dutta & S. K. Pradhan

Part of the book series: Sustainable Textiles: Production, Processing, Manufacturing & Chemistry ((STPPMC))

Abstract

Over the past few decades, nanocrystalline metal oxide semiconductor-based photocatalytic technology has drawn significant attention for reducing the recent energy crisis by converting solar energy into potential energies and remediating environmental pollution. Two traditional semiconductors, TiO_2 and ZnO, have been widely investigated as a photocatalyst for water purification among several metal oxide semiconductors. However, the photocatalytic performance of the above-mentioned metal oxide-based

research facilities in the Dept. of Physics of the University of Burdwan through CAS-I, CAS-II and FIST programs, respectively. M. Mondal wishes to thank the Govt. of West Bengal for financial support through the Vivekananda Merit-Cum-Means fellowship for non-NET fellows.

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Chapter

Synthesis, Structural and Electrical Characterization of NBT:Eu Solid Solution as an Electrolyte Material for SOFC

December 2021

In book: Proceedings of the National Conference on Materials, Devices and Circuits in Communication Technology, 2020

Authors:

Rajdip Roy
University of Burdwan

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University of Burdwan

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MDCCT 2020, The University of Burdwan
29 November – 1 December 2021; pp. 76-79
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Structural and AC conductivity analysis of Gd_2NiTiO_6 double Perovskite material

Sujan Malik[1] and Abhigyan Dutta[2]
Department of Physics, The University of Burdwan, Burdwan-713104, India.
Email: adutta@phys.buruniv.ac.in[1], sujanmalikphysics@gmail.com[2]

Abstract

This study investigates the structural and electrical properties of double perovskite Gd_2NiTiO_6 (GNT) prepared via the sol-gel combustion method. Rietveld refinement of the XRD pattern confirms the monoclinic structure with space group $P2_1/n$. The crystallite size of the composition sintered at temperature 1200 ºC was found to be ~ 47.14 nm. The electrical study established the dc conductivity to be thermally activated and indicated a negative temperature coefficient of resistance behaviour

INTRODUCTION

Nowadays, the generation of clean and efficient energy is becoming a global requirement. A wide range of materials like CeO_2 based fluorites, stabilized δ-Bi_2O_3, yttria-stabilized zirconia (YSZ), perovskites, intergrowth perovskite-Bi_2O_3 layers, pyrochlore etc have been studied as the oxygen ion conductors. In recent years, the structural and electrical properties of double perovskite-type oxides with the chemical formula $A_2B'B''O_6$ have been studied by various researchers due to their various advanced technological applications. Rare earth cation based double perovskites ($RE_2B'B''O_6$, RE = rare earth, B′/B″ = different transition metals) exhibit various structural and physical properties due to their compositional variations [1]. The structural, electrical and optical properties of Gd_2NiMnO_6 have earlier been studied [2] and the Rietveld refined XRD pattern confirmed the single-phase monoclinic structure with space group $P2_1/n$ with the distribution of ions at crystallographic Wyckoff positions 4*e* for Gd^{3+} ions, 2*c* for Ni^{2+} ions, 2*d* for Mn^{4+} ions, and 4*e* for O^{2-} ions. Each Ni^{2+} and Mn^{4+} ions surrounded by six O^{2-} ions constitute the NiO_6 and MnO_6 octahedra, respectively. M. Rudra et al. [3] reported the temperature-dependent conductivity mechanisms observed in Pr_2NiTiO_6. They also reported that the conductivity, impedance and relaxation spectra highlight the combined contributions of the electrodes, grain-boundaries and grain microstructures to the carrier dynamics in Pr_2NiTiO_6.

This work is focused on the synthesis, structural and electrical properties of double perovskites Gd_2NiTiO_6 which is synthesized by the sol-gel combustion method. The structure of the material was characterized using XRD and the electrical properties were studied using ac conductivity spectra.

EXPERIMENTAL

Materials and Methods

Gd_2NiTiO_6 (GNT) double perovskite was synthesized by the solution combustion method. Gd_2O_3 (Sigma-Aldrich, 99.9%), Nickel (II) nitrate hexahydrate [$Ni(NO_3)_2.6H_2O$] (Merck, 98%), Tetra butyl titanate (TNBT) [$C_6H_{36}O_4Ti$] (SRL) were used as the raw materials. At first, the stoichiometric amount of Gd_2O_3 was dissolved in deionised water in a beaker and stirred using a magnetic stirrer. Nitric acid was mixed into this solution to obtain a clear solution. Next, a stoichiometric amount of $Ni(NO_3)_2.6H_2O$ and TNBT were mixed to the clear solution. Citric acid was mixed to this solution to the molar ratio of ($C_6H_8O_7$): (Gd, Ni, Ti) = 3:1. The total solution was heated and stirred at 80ºC for 8 h to get a homogeneous mixture that becomes gel due to evaporation of water. The gel was dried and partially auto ignited. To complete the ignition process, the partially ignited sample was transferred into a furnace and heated at 200ºC for 2 h. The ignited sample was then collected and ground in an agate mortar. The as-prepared powder was calcined at 600℃ for 2 h. Part of the powder was pressed to obtain a cylindrical pellet with a diameter of 10 mm. The pellets and powder samples were sintered in air at 1200℃ for 4h and used for various analyses.

For structural investigation of the sintered material X-Ray diffraction (XRD) data was taken by X-ray diffractometer (BRUKER, Model D8 Advance–AXS) using CuKα radiation [λ = 1.5406 Å] from 2θ = 20° to 80° with step size 0.02°. Structural parameters were obtained for the samples using the Rietveld refinement method. For electrical measurement, the pellets were polished to acquire a smooth surface, and a high-temperature conductive graphite pest (Merck) was applied on both sides of the pellets to make the electrodes. Electrical measurements were carried out using two probe methods inside a tube furnace. An LCR meter (HIOKI Model: 3532-50) interfaced with a PC was used to collect the electrical data in the frequency ranging from 42 Hz to 5 MHz and in the temperature range from room temperature to 300 °C.

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MDCCT 2020, The University of Burdwan
29 November – 1 December 2021; pp. 44-47
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Synthesis, characterisation, and electrical property study of $ZnSnO_3$ nanopowder

Mamotaj Khatun, Bithika Mandal, Sanjoy Mukherjee and Partha Mitra
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Abstract

This work primarily focuses on grain growth dependent electrical properties of orthorhombic $ZnSnO_3$ prepared by co-precipitation method. Effects of sintering temperature (from 500ºC to 650ºC) on the size of grain, surface morphology and electrical properties were investigated. Single phase and crystallinity improvement was confirmed by XRD spectrum. Crystallite size of $ZnSnO_3$ powders were observed from ~9.02 nm to ~12.23 nm, calculated from XRD patterns using Scherrer equation. Grain growths of the samples were observed from the FESEM micrographs which are in good agreement with the crystallite size calculated from Scherrer equation. Complex impedance spectroscopy (CIS) analysis shows non-Debye type depressed semi-circular nature of the Nyquist plot. Frequency variable conductivity curves of the prepared samples show conductivity value increases with increasing temperature as well as increasing sintering temperature. Thus the mechanism confirms thermally activated process. Conductivity was higher for sample sintered at higher temperature (650ºC) which might be associated with enhancement of mobility of carriers.

INTRODUCTION

In recent years, many researchers have attracted towards nanosized perovskite metal oxide compounds due to their widespread and praiseworthy application prospects in different fields. These n-type semiconducting perovskites possess unique properties due to their high surface to volume ratio, quantum confinement effect, better reaction rate etc. [1]. Perovskite oxides have the general formula ABO_3 where A- cation is larger in size than B- cation. The B-cation is in 6-fold co-ordination whereas the A- cation is in 12-fold cuboctahedral co-ordination in the crystal structure. Among different nanostructured perovskites, $ZnSnO_3$ exhibits interesting application in various electrical, electrochemical, optoelectronic and magneto electronic devices like solid oxide fuel cells (SOFCs), energy conversion devices, lithium-ion batteries, super capacitors, gas sensors, oxygen sensors, photocatalyst etc. In addition, presence of edge sharing SnO6-ZnO6 octahedral framework in orthorhombic crystal system of $ZnSnO_3$ ensures dispersed conduction band mediated enhanced mobility of charge carriers exerts remarkable role in the electrical properties [2]. Several processing routes such as solid state calcinations, spray pyrolysis, hydrothermal method, chemical method, and mechano-chemical milling method have been employed to synthesize Zinc stannate nano-particles [3]. The formation of $ZnSnO_3$ was affected by the reaction conditions such as molar ratio of the precursors, reaction temperature, reaction time, pH of the solution, reaction rate etc. In the present work, we have made an attempt to synthesize well crystalline $ZnSnO_3$ samples by simple chemical co-precipitation method. The effect of sintering temperature on the crystallite size and physicochemical properties of the $ZnSnO_3$ sample has been studied. To investigate the crystalline phase and morphology of the samples, XRD and FESEM were employed. The basic motivation for the present work was to study the influence of grain size on electrical properties. Impedance and conductivity study of the fabricated samples establishes structure-property correlation quite well.

EXPERIMENTS

A. Material Synthesis

In this paper, nanosized $ZnSnO_3$ particles were synthesized using a novel co-precipitation method, which produces good crystalline materials without any further secondary phase. The preparation of $ZnSnO_3$ was based on the following reaction:

$$ZnAc_2 + SnCl_4 + 6NaOH = ZnSnO_3 + 4NaOH + 2NaAc + 3H_2O \quad (1)$$

0.5 M zinc acetate ($ZnAc_2.2H_2O$, analytical grade) and 0.5 M tin tetrachloride ($SnCl_4.5H_2O$, analytical grade) were used as precursors without further purification, and dissolved into deionized water to form two separate transparent solutions respectively. The two solutions were mixed together. Then sodium hydroxide (NaOH) solution was added dropwise into the mixture under magnetic stirring until the pH of solution ~10. The white precipitate was collected, filtered, washed with deionized water, and dried at 100 °C to eliminate the unwanted soluble ions. The as- synthesized powder was initially hand grinded with a pestle and mortar. Then it was

An Alternative Scheme of Quantum Optical Superfast Tristate CNOT Gate Using Frequency Encoding Principle of Light with Semiconductor Optical Amplifier

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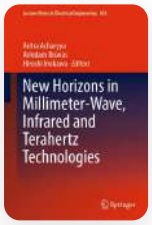

New Horizons in Millimeter-Wave, Infrared and Terahertz Technologies

Snigdha Hazra & Sourangshu Mukhopadhyay

Part of the book series: Lecture Notes in Electrical Engineering ((LNEE,volume 953))

Abstract

Photon is established as a strong and promising candidate in all-optical signal processing and superfast computing. Again, it is found that photon has a successful approach to be used as a quantum mechanical particle. For this reason, it is used as a carrier of information in optical systems instead of electrons in electronic systems. All-optical

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Use of Frequency Encoding Principle for Implementing Nano-Photonic Ultrafast Tristate Pauli X Gate

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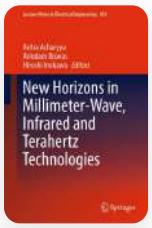

New Horizons in Millimeter-Wave, Infrared and Terahertz Technologies

Ayan Dey & Sourangshu Mukhopadhyay

Part of the book series: Lecture Notes in Electrical Engineering ((LNEE,volume 953))

Abstract

Optics has been found significant to take part in Quantum Computation as a carrier signal. In the last few years number of research articles were published where optics is used massively for implementing Quantum gates. In this chapter, an all-optical tristate Pauli X Gate has been designed with SOA-based optical switches using Frequency-encoded principles. Here, this design has three input signals and three output channels as

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Abstract

One of the essential components of many microwave circuits is the branch-line coupler (BLC). In this work, a BLC using apertures and shorting post is investigated to obtain a broad-band response characteristic. A delay line has also been introduced to maintain its

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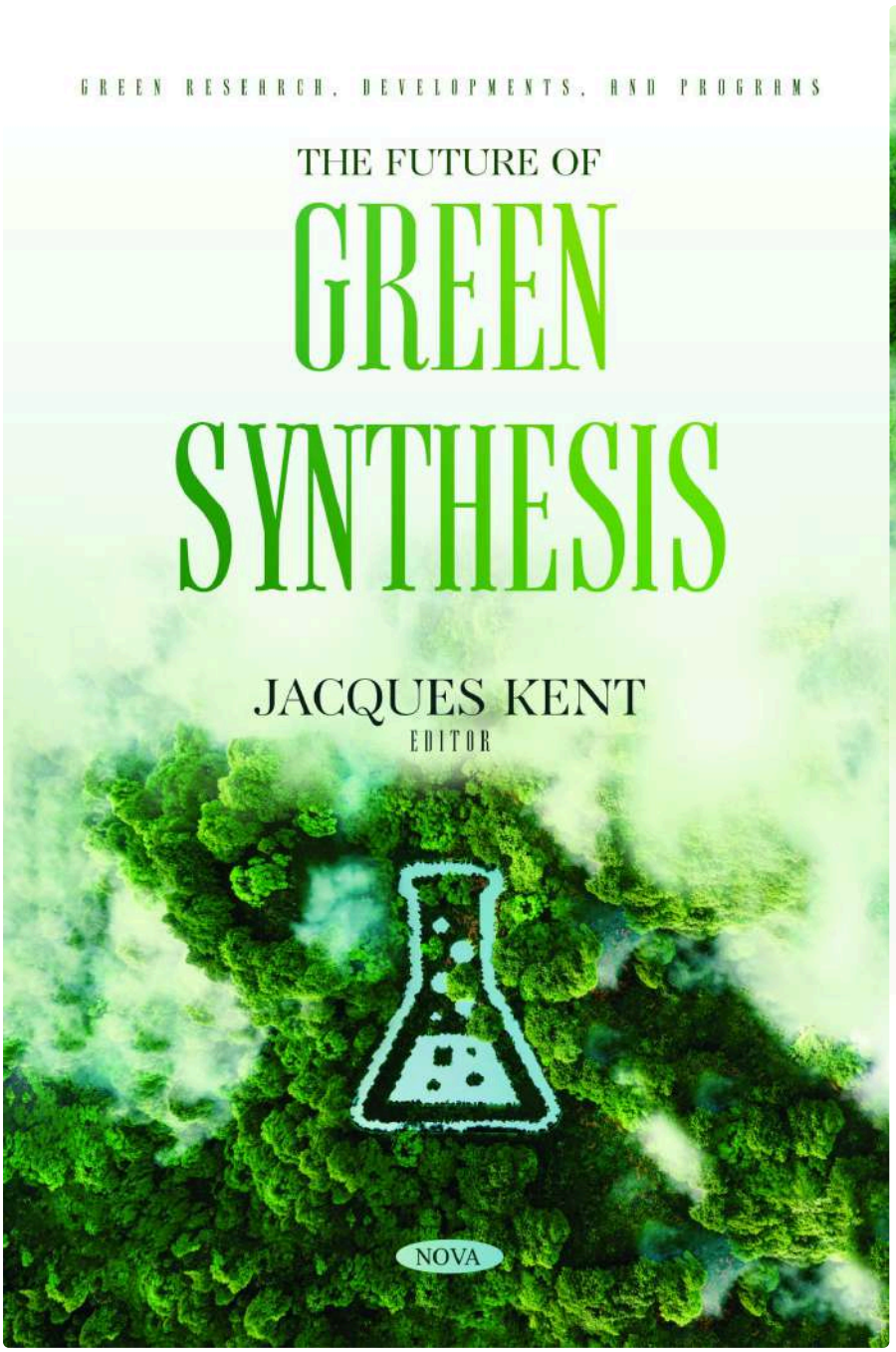

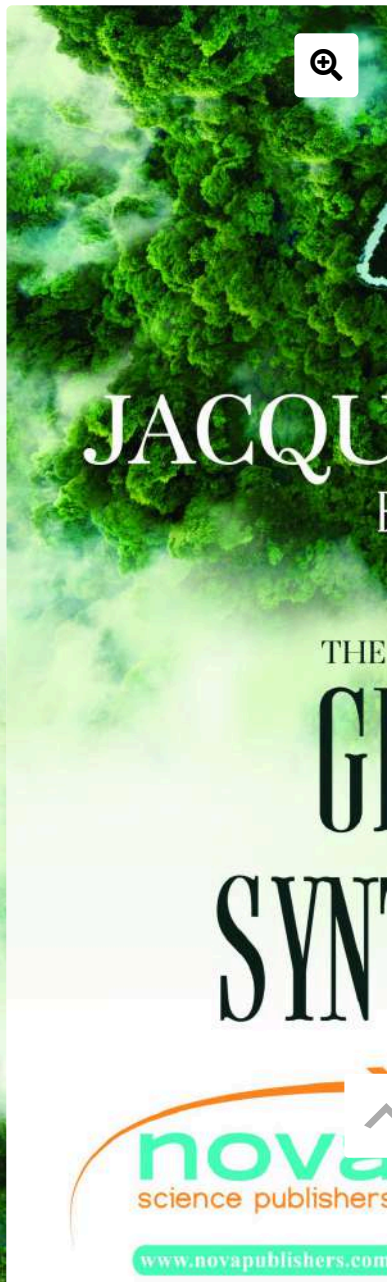

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Zsuzsanna Szalai
Department of Organic Chemistry and Technology, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology and Economics, Budapest, Hungary

Chapter 7. The Exploration of Greener Technologies in the Synthesis of Anti-COVID-19 Drugs

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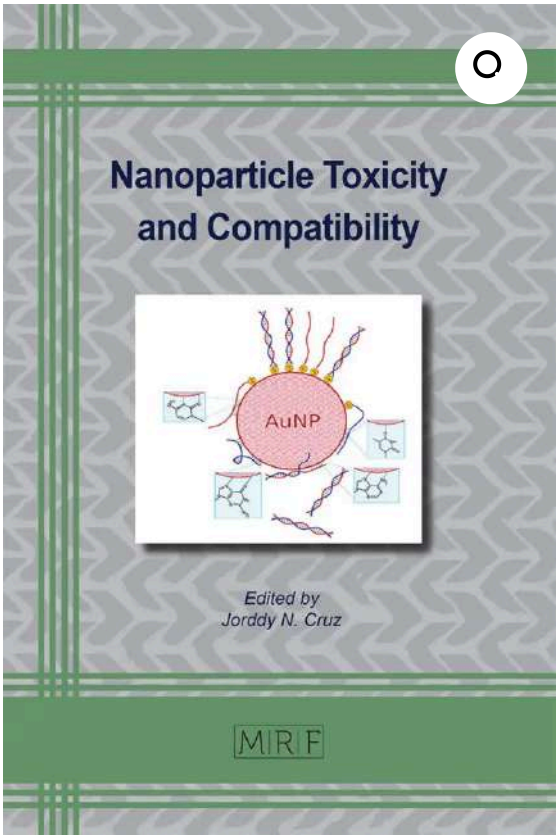

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Rahul Das, Manab Deb Adhikari, Pratap Singh Chauhan

Nowadays, nanomaterial-based technologies have reached a great height from the application point of view. However, this chapter is mainly focused on nanomaterials research for biological applications and its future directions. Depending on the shape, size and elemental composition, nanomaterials are capable of exhibiting some unique and remarkable functional properties. Due to such functional properties, nanomaterials have attracted much attention for biomedical applications and are being tested for easier treatment and

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Keywords
Nanomaterials, Nanofabrications, Biological Applications, Diagnostic Tools, Drug Delivery, Tissue Engineering, Nanorobots

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