Physica B 612 (2021) 412896

Contents lists available at ScienceDirect

Physica B: Physics of Condensed Matter

journal homepage: http://www.elsevier.com/locate/physb

Effect of Zn incorporation on physical properties of quaternary 0.7Se–0.2Ge–(0.1-*x*)Sb–*x*Zn chalcogenide system: A theoretical prediction

Rittwick Mondal [a], Yumnam Bonney Singh [b], Anindya Sundar Das [c], Soumyajyoti Kabi [d], Loitongbam Surajkumar Singh [b], Dipankar Biswas [b,e,*]

[a] Department of Basic Science, Edrakpur High School, Birbhum, West Bengal, 731219, India
[b] Department of Electronics & Communication Engineering, National Institute of Technology Manipur, Langol, Imphal, 795004, India
[c] Department of Electronics and Communication Engineering, Swami Vivekananda Institute of Science and Technology, Kolkata, 700145, India
[d] Department of Physics, Hijli College, Kharagpur, 721306, India
[e] Department of Electronics and Communication Engineering, Regent Education and Research Foundation, Barrackpore, Kolkata, 700121, India

ARTICLE INFO

Keywords:
Quaternary chalcogenide glasses
Mean bond energy
Heat of atomization
Chemical bond approach model
CB
and VB potential

ABSTRACT

The present study is dedicated to the theoretical predictions of several physical parameters of the chalcogenide bulk glassy systems having chemical composition 0.7Se–0.2Ge–(0.1-*x*)Sb–*x*Zn with $x = 0.01$, 0.02, 0.03, and 0.05. The result shows the rigid mode as the total number of mechanical constraints greater than 3. The glass formation ability is affirmed by the investigation of the Lone pair electron. Theoretically obtained bandgap energy values exhibit a linear relationship with the cohesive energy values with increasing Zn content. Relative bond probabilities of different bonds have been estimated to identify the most probable bonds. The location of the conduction band potential shifts towards more negative potential with the incorporation of Zn content. The chemical bond approach model has been employed to evaluate the mean bond energy. The minor addition of Zn content introduces a remarkable change in glass transition temperature.

Credit author statement

Dipankar Biswas: Conceptualization, Visualization, Methodology, Supervision, Writing – original draft, Writing – review & editing. Anindya Sundar Das: Methodology, Formal analysis. Yumnam Bonney Singh: Writing – review & editing. Loitongbam Surajkumar Singh: Supervision. Soumyajyoti Kabi: Formal analysis, Resources. Rittwick Mondal: Conceptualization, Visualization, Methodology, Writing – original draft

1. Introduction

The recent progress in the investigation of chalcogenide glass has been influencing the researchers to explore the requirement of advanced technology like phase-change memory devices, optical fibre technology, biosensor application, radiation shielding, inorganic photoresists, and antireflection coating [1–5]. Among different glasses, selenium-based chalcogenide glasses are reckoned as the most significant semiconductors due to their applications in various technological aspects [6,7]. The characteristics of the chalcogenides can be tuned by adding different doping elements. The addition of Sb atoms with the Se brings significant alterations in the compositional matrix, which brings the suitability of the glassy system for the photoconductive devices [8,9]. But, the shortcomings linked with the Se–Sb glassy system are that it has a short lifetime and thermal instability that can be improved by the incorporation of impurity atom-like Ge, which enhances the cross-linking in the glassy network that in turn increases the materials strength [10]. Zn has been added for its significant network-modifying roles in the glass matrix and Zn is also used for photo-doping in chalcogenide amorphous semiconductors [11,12]. The topological investigations of Zn incorporated Se–Ge–Sb alloy possess compositional variation that may be beneficial to explore the underlying physics to realize the structure-property relationships. The class of Se–Ge–Sb glasses is extremely important since, it satisfies the requirements for the fabrication of optical fibres like large bandgap energy value, low dispersion, etc. [13]. A very interesting topological explanation of the glass network was established by Phillips and Thorpe by considering nearest-neighbor bonds as Lagrangian constraints, termed as bending

* Corresponding author. Department of Electronics & Communication Engineering, Regent Education and Research Foundation, Barrackpore, Kolkata-700121, India.
E-mail address: dipankar_aec@rediffmail.com (D. Biswas).

https://doi.org/10.1016/j.physb.2021.412896
Received 23 November 2020; Received in revised form 16 January 2021; Accepted 6 February 2021
Available online 16 March 2021

International Journal of Wireless Information Networks (2021) 28:199–216
https://doi.org/10.1007/s10776-021-00505-y

ARMA Model Based Anycast AODV (ARMA-AAODV) for Performance Improvement in Scalable Mobile Ad Hoc Networks

Subhankar Ghosh[1] · **Anuradha Banerjee**[2]

Received: 11 July 2020 / Revised: 6 January 2021 / Accepted: 28 January 2021 / Published online: 13 February 2021

Abstract
Anycast is a special operation in ad hoc networks, where source communicates with one suitable destination in anycast zone. AAODV or anycast ad hoc on demand distance vector is an anycast routing protocol designed as an extension of AODV protocol to enable any cast operation in ad hoc networks. However, requirement of stability comes to existence where a huge number of data packets are to be transmitted from anycast source to anycast zone. If source elects one particular peripheral node of the anycast zone and the peripheral anycast destination goes out of the specified zone after receiving only a few number of packets , then source has to again broadcast route requests leading to huge message cost in the network. In our present work, we predict the presence of selected peripheral destination in anycast zone based on its history of location and velocity in earlier time stamps, which is used during route selection in AAODV. Also flooding of route request is directional based on coordinates of anycast zone supplied to the source. This helps to restrain flooding of route request within a limited portion of network.

Keywords Anycast · ARMA model · Energy · Lifetime · Network performance

1 Introduction

A mobile ad hoc network is an infrastructure less network where the nodes are free to move independently in any directions. It is a collection of mobile devices or nodes that collaborate with each other to bridge the gap between a given pair of source and destination nodes where the destination is outside radio range of source. These networks are extremely important for rescue services in battle field and natural disasters like flood, earthquake etc, where quick deployment and mitigat ion are necessary. The routing protocols proposed for ad hoc networks [1], can be broadly divided in to proactive and reactive routing protocols. In proactive routing protocols nodes proactively store route information to every other node of the network, in a table. This is not practical for large and scalable networks where number of nodes is huge. This will lead to huge storage overhead, because information is stored about both active and inactive routes [2–4].

Reactive protocols reduce this overhead by inculcating the energy cost of route discovery. In these protocols route request packets are broadcast in the network and as soon as one reaches the designed destination, it generates route reply and sends that back to source [5]. This network wide flooding is very costly and therefore, we need to implement ad hoc networks in energy efficient manner. Energy saved means increase in lifetime of routers and higher network throughput.

Anycast is an operation where source intends to deliver a set of message packets to any one node within a predefined region. Automatically this gives rise to an intuition that directional flooding can be applied here so that route request do not get unnecessarily scattered network wide, but rather targeted to the specific anycast region. This will reduce message cost, energy cost and improve lifetime. Ad hoc on demand distance vector or AODV is a protocol that elects the path with minimum hop count among multiple route options between one particular pain of source and destination nodes AAODV is mapping of AODV in the context

✉ Subhankar Ghosh
redhatsubha@gmail.com

Anuradha Banerjee
anuradha79bn@gmail.com

[1] Department of Computer Science and Engineering, Regent Education and Research Foundation, Kolkata, West Bengal, India

[2] Department of Computer Applications, Kalyani Govt. Engg. College, Kalyani, West Bengal, India

Materials Chemistry and Physics 255 (2020) 123561

Contents lists available at ScienceDirect

Materials Chemistry and Physics

journal homepage: www.elsevier.com/locate/matchemphys

Influence of samarium content on structural, thermal, linear and non-linear optical properties of $ZnO–TeO_2–P_2O_5$ glasses

Rittwick Mondal [a], Dipankar Biswas [b], Anindya Sundar Das [c], R.K. Nanao Ningthemcha [d], Debalina Deb [e], Subhratanu Bhattacharya [e], Soumyajyoti Kabi [f,*]

[a] Department of Basic Science, Edrakpur High School, Birbhum, 731219, West Bengal, India
[b] Department of Electronics and Communication Engineering, Regent Education and Research Foundation, Barrackpore, Kolkata, 700121, India
[c] Department of Electronics and Communication Engineering, Swami Vivekananda Institute of Science and Technology, Kolkata, 700145, India
[d] Department of Electronics & Communication Engineering, National Institute of Technology Manipur, Langol, Imphal, 795004, India
[e] Department of Physics, University of Kalyani, Kalyani, Nadia, 741235, West Bengal, India
[f] Department of Physics, Hijli College, Kharagpur, 721306, India

HIGHLIGHTS

- Samarium oxide doped mixed former phospho-tellurite glass has been synthesized.
- Several optical parameters have been estimated from UV-VIS study.
- Samples are amorphous, conducting and reflecting in nature.
- Increase of samarium oxide content enhances the thermal stability, compactness and energy band gap of the glasses.

ARTICLE INFO

Keywords:
Mixed former glass
Optical band gap
Urbach energy
Third-order nonlinearity
Oxide ion polarizability
Optical basicity

ABSTRACT

The present work reports on an extensive study on structural, thermal, optical, and non-linear optical properties of zinc oxide modified phospho-tellurite glass as a function of doped samarium oxide content. By using the well-known Archimedes method, the densities of the samples have been estimated. The thermal properties of the glasses have been investigated by differential scanning calorimetry (DSC) measurements. The structural study of these glasses has been performed by X-ray diffraction (XRD) studies and Fourier transformation infrared (FTIR) analysis. The UV–visible spectra of these glasses have been studied, which indicates the indirect nature of the electronic transition. The optical band gap energy (E_{opt}) and Urbach energy of these glass system have been estimated from their ultraviolet edges. Both parameters vary in a nonlinear fashion with the concentration of dopant samarium ion. The refractive index and polarizability of the glass samples have been estimated using the Dimitrov equation and Lorentz-Lorentz equation, respectively. A theoretical approach has been used to evaluate several parameters like non-linear refractive index, oxide ion polarizability, optical basicity, and the third-order optical susceptibility, which are correlated with the composition of the glasses. The obtained results reveal that small increment in samarium oxide content enhances the thermal stability of the glasses.

1. Introduction

The investigation on Phospho-Tellurite glasses draws great attention for the application of glasses in different optical devices such as solid-state lasers, sensors, optical fibers, and color display devices [1–5]. In the case of such applications, the modification of the physical and optical properties by tuning the composition of the glasses are interesting for research work. This tuning can be achieved in different ways. The present paper focuses on the modification of linear and non-linear optical and other physical properties in zinc oxide doped phospho-tellurite glasses by varying the samarium oxide content with minor quantity in the glass matrix. It is well known that the tellurite

* Corresponding author.
E-mail addresses: rit_tu@rediffmail.com (R. Mondal), dipankar_aec@rediffmail.com (D. Biswas), anindyasundardas03@gmail.com (A.S. Das), rknanao25@gmail.com (R.K.N. Ningthemcha), debalinadeb03@gmail.com (D. Deb), subhratanu1@gmail.com (S. Bhattacharya), soumya.kabi@gmail.com (S. Kabi).

https://doi.org/10.1016/j.matchemphys.2020.123561
Received 7 June 2020; Received in revised form 11 July 2020; Accepted 13 July 2020
Available online 21 July 2020
0254-0584/

AIJR Preprints
Section: Coronavirus
Article Id: 93, Version: 1, 2020
URL: https://preprints.aijr.org/index.php/ap/preprint/view/93
{Click on above link to see the latest available version of this article}

NOT PEER-REVIEWED

Version 1: Received: 24 May 2020 / Approved: 05 June 2020 / Online: 05 June 2020

An Effective Approach to Reduce the Penetration Potential of SARS-CoV-2 and other Viruses by Spike Protein: Surface Particle Electrostatic Charge Negotiation

Kausik Rakshit[a], Sudip Chatterjee[a*], Durjoy Bandyopadhyay[a], Somsekhar Sarkar[b]

[a] Swami Vivekananda University, Regent Education and Research Foundation, Barrack Pore, Kolkata 700121, India
[b] 2nd Year, Integrated BS-MS UG student, Indian Institute of Science Education and Research, KOLKATA

*corresponding author's email: **********

ABSTRACT

The objective of this paper is to provide a mathematical model to construct a barrier that may be useful to prevent the penetration of different viruses (e.g. SARS-COV-2) as well as charged aerosols through the concept of electrostatic charge negotiation. (Fusion for the opposite types of charges and repulsion for the similar types of charges). Reviewing the works of different authors, regarding charges, surface charge densities (σ), charge mobility (μ) and electrostatic potentials of different aerosols under varied experimental conditions, a similar intensive study has also been carried out to investigate the electron donating and accepting (hole donating) properties of the spike proteins (S-proteins) of different RNA and DNA viruses, including SARS-COV-2. Based upon the above transport properties of electrons of different particles having different dimensions, a mathematical model has been established to find out the penetration potential of those particles under different electrostatic fields. An intensive study have been carried out to find out the generation of electrostatic charges due to the surface emission of electrons (SEE), when a conducting material like silk, nylon or wool makes a friction with the Gr IV elements like Germanium or Silicon, it creates an opposite layer of charges in the outer conducting surface and the inner semiconducting surface separated by a dielectric materials. This opposite charge barriers may be considered as Inversion layers (IL). The electrostatic charges accumulated in the layers between the Gr IV Ge is sufficient enough to either fuse or repel the charges of the spike proteins of the RNA, DNA viruses including COVID-19 (RNA virus) or the aerosols.

Keywords: SEE, Transport properties, IL, surface charge density, COVID – 19

How to Cite:

Kausik Rakshit *et al.* "An Effective Approach to Reduce the Penetration Potential of SARS-CoV-2 and other Viruses by Spike Protein: Surface Particle Electrostatic Charge Negotiation". *AIJR Preprints*, 93, version 1, 2020. https://preprints.aijr.org/index.php/ap/preprint/view/93

JOURNAL OF ELECTROMAGNETIC WAVES AND APPLICATIONS
https://doi.org/10.1080/09205071.2020.1839568

Silicon waveguide as virtual photonic bandgap structure array for realizing compact optical filters

Rajorshi Bandyopadhyay, Saikat Majumder and Rajib Chakraborty

Department of Applied Optics and Photonics, University of Calcutta, Kolkata, India

ABSTRACT

An engineered silicon rib waveguide on Silicon-On-Insulator platform which can act as virtual photonic bandgap structure is proposed. Selective periodic etching of materials from a rib waveguide is done to create a periodic rib-ridge structure. Each of the rib-ridge sections will therefore have different effective refractive indices and will act as virtual multilayered periodic structure or one-dimensional photonic bandgap structure. Their spatial positions and widths can be controlled to realize different type of photonic filters for integrated photonics applications. Realization of narrowband, multiband and band-pass filter are shown here. These types of waveguide based monomaterial optical filters avoid the challenges generally faced while fabricating multilayer structures of different heterogeneous materials having different refractive indices. Moreover, as the device is waveguide based, its size is very small and will be useful for compact integrated photonics.

ARTICLE HISTORY
Received 3 December 2019
Accepted 16 October 2020

KEYWORDS
Silicon-on-Insulator; rib waveguide; photonic bandgap structure; optical filters; C band communication; WDM technologies

1. Introduction

Localized refractive index perturbation (or defect) introduced in a multilayer photonic bandgap structure (PBGS) are conventionally used to obtain a transmission band within reflection band. Optical filters can be designed by utilizing a quarter-wave phase shifted Fabry–Perot cavity resonator and also by non-quarter-wave structure [1, 2]. Multilayer thin film optical wavelength filters are used for numerous types of application [1–6]. Although several technologies have been proposed to fabricate multilayer thin film filters [3, 4], fabrication of these filters with sub-wavelength dimensions workable in terahertz frequency regions is not always an easy task [5]. To obtain a transmission band having bandwidth in nanometer scale with well-suppressed sideband, tens or even hundreds of thin film layers of different heterogeneous materials are required. However, as the number of layers increases, the material imperfection and errors associated with the deposition process increases the loss. Adsorption of water molecule in thin layers and stress due to unequal thermal expansion of different layers are the common problems associated with the conventional film deposition technology, which deteriorates the performance of the filter device [7,8]. For

CONTACT Rajib Chakraborty rcaop@caluniv.ac.in Department of Applied Optics and Photonics, University of Calcutta, JD-2, Sector III, Salt Lake, Kolkata 700 106, India

Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Characterization of tool wear in similar and dissimilar joints of MS and SS using EAFSW

Kaushik Sengupta *, Dilip K. Singh, Arpan K. Mondal *, D. Bose, Debtanu Patra, Arindam Dhar

National Institute of Technical Teacher's Training and Research, Fourth Ave, FC Block, Sector III, Salt Lake, Kolkata 700106, India

ARTICLE INFO

Article history:
Received 5 September 2020
Received in revised form 24 September 2020
Accepted 2 October 2020
Available online xxxx

Keywords:
Electric Assisted Friction Stir Welding
Mild steel
Stainless steel
UTS
Tool wear

ABSTRACT

Friction Stir Welding (FSW) faces many issues while joining high strength material. In this study an external secondary heat source from a DC source kept at 4 V supply has been used to in between the tool and the workpiece to give an external heat source to FSW and use the method as Electrically Assisted Friction Stir Welding (EAFSW) process. This study represents analysis of mechanical properties of Mild steel (MS) and Stainless-Steel (SS) joint, made by both FSW and EAFSW. An effect of the secondary heat source of electric energy on the mechanical property of the joint and to the tool wear while joining similar and dissimilar material of MS and SS has also been studied. The study represented the effect of the addition of a secondary heat source of an electric current heating to FSW and the impact of various process parameters like tool rpm and feed on the tool wear. The results have been shown to express an expected tool life of WC tool material for joining mild steel and stainless steel. Th experimentation has proved the suitability of Tungsten Carbide as tool material for joining high strength material such as MS and SS. It has also been observed that with suitable utilization of process parameters and secondary heat sources, the heat at the nugget zone increases causing better mixing of the nugget zone. Due to a generation of higher heat at the nugget zone, less tangential and radial load occurs at the tool pin resulting less tool wear and better tool life.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Advances in Materials Processing & Manufacturing Applications.

1. Introduction

Friction Stir Welding (FSW) used successfully for joining low strength material but faces many problems like tool wear, lack in weld efficiency, etc. To resolve such problems, many hybrid FSW techniques has come up with secondary heat sources added to FSW like Laser, induction heat, plasma, electric, etc. The secondary heat source increases heating effect at the stir zone thereby generating sufficient heat to join the material. Electric Assisted Friction Stir Welding (EAFSW) is one of the hybrid FSW techniques, which may be used to join low and high strength material [1]. In EAFSW, ohmic heating is used by an application of electric current between the tool and the work piece, which in turns generates a heat to assist the joining process [1,2]. It has also been seen that the joint prepared by EAFSW has better efficiency than that made by FSW [3]. EAFSW was successfully used to join low and high strength material and also for joining low to high strength material with suitable process parameters [4,5]. But, both FSW and EAFSW processes suffers from a problem of tool wear. Different tool material has been used for joining of different low and high strength material. Bist et al. [6] have worked on the tool wear rate and reported that the tool wear rate depends on the process parameters (like tool material and reinforcement, tool rotational and transverse speed. Sahlot et al. [7] have used a steel tool to find out the wear rate during FSW welding. Prater [8] has investigated a robust method of tool wear measurement with FSW. But, with EAFSW the tool wear has not been studied till now and the study of the same may help to estimate the tool life by EAFSW. It is very necessary to know the tool life while joining the material by FSW or hybrid FSW method. Shaffera et al. [10] also have used XSYTIN-1 tool to successfully join Al to mild steel by EAFSW and the similar issue related to the tool wear and tool life were reported.

In this manuscript, it has been focused to know the tool wear while joining high strength material by a WC tool. The tool design used as cylindrical plane with flat head. The mechanical property of similar material joint made up of Mild steel to Mild Steel and

* Corresponding authors.
E-mail address: arpan@nitttrkol.ac.in (A.K. Mondal).

https://doi.org/10.1016/j.matpr.2020.10.012
2214-7853/
Selection and peer-review under responsibility of the scientific committee of the International Conference on Advances in Materials Processing & Manufacturing Applications.

International Journal of Applied Metaheuristic Computing
Volume 12 • Issue 2 • April-June 2021

Multi-Objective Economic Environmental Dispatch of Variable Hydro-Wind-Thermal Power System

Suman Kumar Dey, Jadavpur University, India
Deba Prasad Dash, Government College of Engineering, Kalahandi, India
Mousumi Basu, Jadavpur University, India

ABSTRACT

This article presents a multi-objective economic environmental/emission dispatch (EED) of variable head hydro-wind-thermal power system. The combination of NOx emission, SO2 emission, and fuel cost are minimized for non-smooth hydrothermal plants while satisfying various operational constraints like non-smooth fuel cost, penalty coefficient, and wind power uncertainty. The objectives—cost, NOx emission, and SO2 emission—are optimized at the same time. In this research, the non-dominated sorting genetic algorithm-II (NSGA-II) has been employed for solving the given problem where the total cost, NOx emission level, and SO2 emission level are optimized at the same time while satisfying all the operational constraints. The simulation results that are obtained by applying the two test systems on the proposed scheme have been evaluated against strength pareto evolutionary algorithm 2 (SPEA 2).

KEYWORDS

Cascaded Reservoirs, Fuel Cost, Hydro-Wind-Thermal Power System, NOx Emission Level, NSGA-II, SO2 Emission Level, Wind Power Uncertainty

INTRODUCTION

Electricity generation from fossil fuel releases various types of pollutants such as sulfur dioxide (SO_2), nitrogen oxides (NO_x) and carbon dioxide (CO_2), which are discharged in the air. Hence, reducing the air pollution is one of the major challenges for electric utilities. The 1990 Clean Air Act is aimed at decreasing acid rain and green house gases. This also necessitate that the fossil-fired electric power plants must reduce its sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emission level (Le, K. D et al., 1995). Nowadays, the modern civilization requires adequate and secure electricity at economical cost as well as at minimized echelon of pollution.

Various methods have been suggested in the literature to bring down the environmental pollution (Talaq, J. H et al., 1994). This considers the installation of switching device that maintains the emission level, use of low emission fuels, replacement of the old burners with new ones and dispatching with emission consideration. The three initial methods require the setting up of new equipments and/or alteration of the existing equipments that involves significant funds disbursement. Therefore, the

DOI: 10.4018/IJAMC.2021040102