Issn 0973-9777 Volume-6 Number-2 March-April 2012

The Indian Journal of Research Anvikshiki

Bi-monthly International Journal of all Research
www.onlineijra.com

Engineering and Technology

Anvikshiki
The Indian Journal of Research

Bi-Monthly International Journal of All Research

Abstracts and Indexing

Listed in ICMJE ,www.icmje.org, banaras.academia.edu, ebookbrowse.com, BitLibrary! http:/ www.bitlib.net/, ,freetechebooks.com, ,artapp.net,Catechu PDF /printfu.org, ,www.fileaway.info, ,http://www.docslibrary.com, ,Android Tips, Apps, Theme and Phone Reviews http://dandroidtips.com, , http://www.edu-doc.com, www.themarketingcorp.com,Dunia Ebook Gratis duniaebook.net, ,www.cn.doc-cafes.com., ,http://scholar.google.co.in, http ://nkrc.niscair.res.in/ Browse by Title.Php ?Keyword=A

Website : www.onlineijra.com.Motilal Banarasi Das Index,Varanasi, Motilal Banarasi Das Index,Delhi. Banaras Hindu University Journal Index,Varanasi. www.bhu.ac.in, D.K.Publication Index, Delhi. National Institute of Science Communication and Information Resources Index, New Delhi.

Subscriptions

Anvikshiki,The Indian Journal of Research is Published every two months (January,March,May,July,September and November) by mpasvo Press,Varanasi.u.p.India. A Subscription to The Indian Journal of Research : Anvikshiki Comprises 6 Issues in Hindi and 6 in English and 3 Extra Issues. Prices include Postage by Surface mail,or For Subscription in the India by Speed Post. Airmail rates are also available on request. Annual Subscriptions Rates (Volume 3,6 Issues in Hindi,6 Issues in English and 6 Issues of science 2012):

Advertising & Appeal

Inquiries about advertising should be sent to editor's address. Anvikshiki is a self financed Journal and support through any kind or cash shall be highly appreciated. Membership or subscription fees may be submitted via demand draft in faver of Dr. Maneesha Shukla and should be sent at the address given below. Sbi core banking cheques will also be accepted.

All correspondence related to the Journal should be addressed to

B.32/16 A., Flat No.2/1,Gopalkunj,Nariya,Lanka, Varanasi, U.P.,India

Mobile : 09935784387,Tel.0542-2310539.,e-mail : maneeshashukla76@rediffmail.com,www.anvikshikijournal.com

Office Time : 3-5 P.M.(Sunday off)

Journal set by

Maheshwar Shukla,maheshwar.shukla@rediffmail.com

9415614090

Printed by

mpasvo Press

Maneesha Publication

(Letter No.V-34564,Reg.533/2007-2008)

B-32/16-A-2/1,Gopalkunj,Nariya,Lanka

Varanasi,U.P.,India

Anvikshiki
The Indian Journal of Research
Volume 6 Number 2 March 2012

Engineering and Technology
Papers

PRINT ISSN 0973-9777,WEBSITE ISSN 0973-9777

BANARAS HINDU UNIVERSITY
DEPARTMENT OF CHEMICAL ENGINEERING & TECHNOLOGY
(CENTRE OF ADVANCED STUDY & DST DEPARTMENT UNDER FIST)
INSTITUTE OF TECHNOLOGY
(Varanasi – 221005)
(Established by Parliament by Notification No.225 of 1916)

Message

Scientific discoveries and advancement affect our lives by providing new policies and regulations that provide broad national direction and by new products that enhance our lives. Technology and engineering translate scientific knowledge into action. At the same time, technological innovations often require further research into materials, devices and processes. Engineers use the knowledge of science, mathematics, economics and appropriate experience to find suitable solutions to the problems and helps in creating an appropriate mathematical model for analysis.

This special issue on Engineering and Technology 2012 of Anvikshiki brings together the latest developments in technology and gives a base for the future work to be done in respective areas.

I wish the journal to be a great success.

Bhawna Verma
Assistant Professor
Department of Chemical Engineering & Technology
Center of Advanced Study
Institute of Technology
Banaras Hindu University
Varanasi – 221005

Fax (फैक्स) : 091-0542-2368092 Email: head.che@itbhu.ac.in; ☎ 0542-2368092, 6702029, 2307045, 6702024

BANARAS HINDU UNIVERSITY
DEPARTMENT OF CHEMICAL ENGINEERING & TECHNOLOGY
(CENTRE OF ADVANCED STUDY & DST DEPARTMENT UNDER FIST)
INSTITUTE OF TECHNOLOGY
(Varanasi – 221005)
(Established by Parliament by Notification No.226 of 1916)

Message

I express my sincere gratitude to the editorial board of prestigious journal ANVIKSHIKI for believing in my technical competencies and choosing me as a reviewer of special issue on Engineering and Technology 2012. I understand that with great role comes great responsibilities. I will try to fulfill this highly valued responsibility with best of my technical knowledge and human values. This journal has been a guiding beacon for scientific community for numerous years & has gained the prestige due to it's original & rich articles. The contribution of ANVIKSHIKI in field of scientific research is immense.

I wish for the phenomenal success of special issue on Engineering and Technology,2012 of ANVIKSHINKI.

P K S Dikshit
Professor
Department of Civil Engineering
Institute of Technology
Banaras Hindu University
Varanasi 221005

Fax (निवास) : 091-0542-2368092 Email: head.che@itbhu.ac.in; ☎ 0542-2368092, 6702029, 2307045, 6702024

Editorial Note

As my nomination as an Subject Expert and Editor for this Special Issue on Engineering & Technology 2012, I have worked a lot to make it successful. I do whatever task is at hand to the best of my ability. I take pride in my work and give hundred percent every time. For those submissions that were not suitable for publication, we tried to let authors know very quickly of our decision, giving them a chance to submit their manuscript to another journal if they so desire. I am fully aware that the prestige and quality of an ANVIKSHIKI Journal depends upon the altruistic participation of reviewers and the fairness and promptness with which the review process is conducted. In this regard, I wish to express my sincere gratitude to all board members for their nice cooperation and sustained effort. However, because of the increased number of submissions and the diversity of research fields involved, we have a difficult task ahead of us requiring a more rapid tempo of review. At the same time, from now on the authors themselves should assume their own inescapable responsibilities. The editor will return immediately any manuscript that is incomprehensible to reviewers on account of substandard grammar and syntax.

Finally, it is a pleasure to thank my Editor in chief for their nice cooperation and valuable suggestion. Now, we all look forward to embarking in a journey that can take ANVIKSHIKI on to the next plateau of excellence.

I hope you will enjoy reading this issue and we welcome your feedback .

With best regards,

Jyoti Prakash

OTHER MPASVO JOURNALS

1. **World Journal of Modern and Ayurvedic Medical Science** (Appear on 2012, Format of the Serial : Online, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
2. **World Journal of Science Development** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Bi-Annual) Life Time Fee : Indian Members 10,000/-rs. International Members $5000
3. **World Journal of Social Research** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
4. **World Journal of Humanities Research** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
5. **World Journal of Commerce and Management** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
6. **World Journal of Literature and Languages** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
7. **International Journal of Physics Inventions** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
8. **Asian Journal of Women's Studies and Development** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
9. **Asian Journal of Invironmental Studies** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
10. **Asian Journal of Education and Knowledge** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
11. **World Journal of Home Science Research** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
12. **Asian Journal of Religion, Philosophy and Peace Studies** (Appear on 2012, Format of the Serial : Online & Print, Frequency : Annual) Life Time Fee : Indian Members 5000/-rs. International Members $5000
13. **Global Journal of Engineering and Technology (**Appear on 2012, Format of the Serial : Online & Print, Frequency : Six Monthly) Life Time Fee : Indian Members 10,000/-rs. International Members $5000**)**

Introducing ‘‘Global Journal of Engineering and Technology”

Dear Colleague,

Global Journal of Engineering and Technology Research (GJET) is a multidisciplinary peer-reviewed journal published six monthly by mpasvo Journals (http://www.onlineijra.com/gjet). GJET is dedicated to increasing the depth of the subject across disciplines with the ultimate aim of expanding knowledge of the subject.

Call for Papers

GJET will cover all areas of the subject. The journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence, and will publish: Original articles in basic and applied research**,** Case studies**,** Critical reviews, surveys, opinions, commentaries and essays.We invite you to submit your manuscript(s) to **maneeshashukla76@rediffmail.com** for publication in the six Monthly Issue. Our objective is to inform authors of the decision on their manuscript(s) within eight weeks of submission. Following acceptance, a paper will normally be published in the next issue. Instruction for authors and other details are available on our website; www.onlineijra.com/gjet

GJET is an Open Access Journal

One key request of researchers across the world is unrestricted access to research publications. Open access gives a worldwide audience larger than that of any subscription-based journal and thus increases the visibility and impact of published works. It also enhances indexing, retrieval power and eliminates the need for permissions to reproduce and distribute content. GJET is fully committed to the Open Access Initiative and will provide free access to all articles as soon as they are published.

Best regards,

Dr. Maneesha Shukla.

Editor in chief,

NAME OF JOURNAL

Global Journal of Engineering and Technology (GJET)

ISSN

ISSN …… in process

FREQUENCY

Six-monthly

LANGUAGE

English

LAUNCH DATE

July 1,2012

EDITOR-IN-CHIEF

Dr. Maneesha shukla, Gopalkunj, flat no 1, Naria, Lanka , Varanasi, up, India. maneeshashukla76@rediffmail.com

subject expert

Jyoti Prakash Srivastava

EDITING

Global Journal of Engineering and Technology (GJET)

Gopalkunj, flat no 1,

Naria, Lanka , Varanasi,

up, India pin 221005

Telephone: 0542-2310539

Mobile: 0-99-35-78-43-87

E-mail: maneeshashukla76@rediffmail.com

http://www.onlineijra.com/gjet

http://www.anvikshikijournal.com/gjet

PUBLISHER

Mpasvo

maneesha prakashan evam shodha viveka sanstha

Gopalkunj, flat no 1,

Naria, Lanka , Varanasi,

up, India pin 221005

Telephone: 0542-2310539

Mobile: 0-99-35-78-43-87

E-mail: maneeshashukla76@rediffmail.com

http://www.onlineijra.com/gjet

http://www.anvikshikijournal.com/gjet

Global Journal of Engineering and Technology (GJET)

E-mail: maneeshashukla76@rediffmail.com

Guidelines for Authors

Global Journal of Engineering and Technology is an open access journal that provides rapid publication (six monthly) of articles in all areas of the subject such as: civil, mechanical, chemical, electronic and computer engineering as well as production and information technology. The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published approximately 3 month after acceptance.

Electronic submission of manuscripts is strongly encouraged, provided that the text, tables, and figures are included in a single Microsoft Word file (preferably in Arial font).

Submit manuscripts as e-mail attachment to the Editorial Office at: maneeshashukla76@rediffmail.com A manuscript number will be mailed to the corresponding author same day or within 72 hours.

The **cover letter** should include the corresponding author's full address and telephone/fax numbers and should be in an e-mail message sent to the Editor, with the file, whose name should begin with the first author's surname, as an attachment. The authors may also suggest two to four reviewers for the manuscript (GJET may designate other reviewers).

Global Journal of Engineering and Technology will only accept manuscripts submitted as e-mail attachments.

Article Types

Three types of manuscripts may be submitted :

Regular articles: These should describe new and carefully confirmed findings, and experimental procedures should be given in sufficient detail for others to verify the work. The length of a full paper should be the minimum required to describe and interpret the work clearly.

Short Communications: A Short Communication is suitable for recording the results of complete small investigations or giving details of new models or hypotheses, innovative methods, techniques or apparatus. The style of main sections need not conform to that of full-length papers. Short communications are 2 to 4 printed pages (about 6 to 12 manuscript pages) in length.

Reviews: Submissions of reviews and perspectives covering topics of current interest are welcome and encouraged. Reviews should be concise and no longer than 4-6 printed pages (about 12 to 18 manuscript pages). Reviews are also peer-reviewed.

Review Process

All manuscripts are reviewed by an editor and members of the Editorial Board or qualified outside reviewers. Decisions will be made as rapidly as possible, and the journal strives to return reviewers' comments to authors within 3 weeks. The editorial board will re-review manuscripts that are accepted pending revision. It is the goal of the JETR to publish manuscripts within 10 weeks after submission.

Regular articles

All portions of the manuscript must be typed **double-spaced** and all pages numbered starting from the title page.

The **Title** should be a brief phrase describing the contents of the paper. The Title Page should include the authors' full names and affiliations, the name of the corresponding author along with phone, fax and E-mail information. Present addresses of authors should appear as a footnote.

The **Abstract** should be informative and completely self-explanatory, briefly present the topic, state the scope of the experiments, indicate significant data, and point out major findings and conclusions. The Abstract should be 100 to 200 words in length.. Complete sentences, active verbs, and the third person should be used, and the abstract should be written in the past tense. Standard nomenclature should be used and abbreviations should be avoided. No literature should be cited.

Following the abstract, about 3 to 10 **key words** that will provide indexing references should be listed.

A list of non-standard **Abbreviations** should be added. In general, non-standard abbreviations should be used only when the full term is very long and used often. Each abbreviation should be spelled out and introduced in parentheses the first time it is used in the text. Only recommended SI units should be used. Authors should use the solidus presentation (mg/ml). Standard abbreviations (such as ATP and DNA) need not be defined.

The **Introduction** should provide a clear statement of the problem, the relevant literature on the subject, and the proposed approach or solution. It should be understandable to colleagues from a broad range of scientific disciplines.

Materials and methods should be complete enough to allow experiments to be reproduced. However, only truly new procedures should be described in detail; previously published procedures should be cited, and important modifications of published procedures should be mentioned briefly. Capitalize trade names and include the manufacturer's name and address. Subheadings should be used. Methods in general use need not be described in detail.

Results should be presented with clarity and precision. The results should be written in the past tense when describing findings in the authors' experiments. Previously published findings should be written in the present tense. Results should be explained, but largely without referring to the literature. Discussion, speculation and detailed interpretation of data should not be included in the Results but should be put into the Discussion section.

The **Discussion** should interpret the findings in view of the results obtained in this and in past studies on this topic. State the conclusions in a few sentences at the end of the paper. The Results and Discussion sections can include subheadings, and when appropriate, both sections can be combined.

The **Acknowledgments** of people, grants, funds, etc should be brief.

Tables should be kept to a minimum and be designed to be as simple as possible. Tables are to be typed double-spaced throughout, including headings and footnotes. Each table should be on a separate page, numbered consecutively in Arabic

numerals and supplied with a heading and a legend. Tables should be self-explanatory without reference to the text. The details of the methods used in the experiments should preferably be described in the legend instead of in the text. The same data should not be presented in both table and graph form or repeated in the text.

Figure legends should be typed in numerical order on a separate sheet. Graphics should be prepared using applications capable of generating high resolution GIF, TIFF, JPEG or Powerpoint before pasting in the Microsoft Word manuscript file. Tables should be prepared in Microsoft Word. Use Arabic numerals to designate figures and upper case letters for their parts (Figure 1). Begin each legend with a title and include sufficient description so that the figure is understandable without reading the text of the manuscript. Information given in legends should not be repeated in the text.

References: In the text, a reference identified by means of an author‘s name should be followed by the date of the reference in parentheses. When there are more than two authors, only the first author‘s name should be mentioned, followed by ’et al‘. In the event that an author cited has had two or more works published during the same year, the reference, both in the text and in the reference list, should be identified by a lower case letter like ’a‘ and ’b‘ after the date to distinguish the works.
Examples:
Abayomi (2000), Agindotan et al. (2003), (Kelebeni, 1983), (Usman and Smith, 1992), (Chege, 1998; Chukwura, 1987a,b; Tijani, 1993,1995), (Kumasi et al., 2001)
References should be listed at the end of the paper in alphabetical order. Articles in preparation or articles submitted for publication, unpublished observations, personal communications, etc. should not be included in the reference list but should only be mentioned in the article text (e.g., A. Kingori, University of Nairobi, Kenya, personal communication). Journal names are abbreviated according to Chemical Abstracts. Authors are fully responsible for the accuracy of the references.

Examples:
Chikere CB, Omoni VT and Chikere BO (2008). Distribution of potential nosocomial pathogens in a hospital environment. Afr. J. Biotechnol. 7: 3535-3539.
Moran GJ, Amii RN, Abrahamian FM, Talan DA (2005). Methicillinresistant *Staphylococcus aureus* in community-acquired skin infections. Emerg. Infect. Dis. 11: 928-930.
Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing *Escherichia coli* in the Calgary Health Region: emergence of CTX-M-15-producing isolates. Antimicrob. Agents Chemother. 51: 1281-1286.
Pelczar JR, Harley JP, Klein DA (1993). Microbiology: Concepts and Applications. McGraw-Hill Inc., New York, pp. 591-603.

Short Communications
Short Communications are limited to a maximum of two figures and one table. They should present a complete study that is more limited in scope than is found in full-length papers. The items of manuscript preparation listed above apply to Short Communications with the following differences: (1) Abstracts are limited to 100 words; (2) instead of a separate Materials and Methods section, experimental procedures may be incorporated into Figure Legends and Table footnotes; (3) Results and Discussion should be combined into a single section.

Proofs and Reprints: Electronic proofs will be sent (e-mail attachment) to the corresponding author as a PDF file. Page proofs are considered to be the final version of the manuscript. With the exception of typographical or minor clerical errors, no changes will be made in the manuscript at the proof stage. Because GJET will be published freely online to attract a wide audience), authors will have free electronic access to the full text (in both HTML and PDF) of the article. Authors can freely download the PDF file from which they can print unlimited copies of their articles.

Copyright: Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, or thesis) that it is not under consideration for publication elsewhere; that if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher.

Fees and Charges: Overseas Authors are required to pay a $250 Processing fee and Indian Authors are required to pay a Rs 3000/- Processing fee. Publication of an article in Global Journal of Engineering and Technology is not contingent upon the author’s ability to pay the charges. Neither is acceptance to pay the handling fee a guarantee that the paper will be accepted for publication. Authors may still request (in advance) that the editorial office waive some of the handling fee under special circumstances.

Letter No.V-34564,Reg.533/2007-2008 INDIAN JOURNAL OF RESEARCH(2012)**6,102-112**
ANVIKSHIKI ISSN 0973-9777 Advance Access publication 19 Jan. 2012

STUDIES ON PREPARATION AND CHARACTERIZATION OF PHOSPHATE CONTAINING BIOGLASS-CERAMICS

AJAY KUMAR*

Declaration

The Declaration of the author for publication of Research Paper in The Indian Journal of Research Anvikshiki ISSN 0973-9777 Bi-monthly International Journal of all Research: I, *Ajay Kumar* the author of the research paper entitled STUDIES ON PREPARATION AND CHARACTERIZATION OF PHOSPHATE CONTAINING BIOGLASS-CERAMICS declare that , I take the responsibility of the content and material of my paper as I myself have written it and also have read the manuscript of my paper carefully. Also, I hereby give my consent to publish my paper in Anvikshiki journal , This research paper is my original work and no part of it or it's similar version is published or has been sent for publication anywhere else. I authorise the Editorial Board of the Journal to modify and edit the manuscript. I also give my consent to the Editor of Anvikshiki Journal to own the copyright of my research paper.

Abstract

This study explores the interaction between bioactive glasses and dentin from extracted human teeth in simulated oral conditions. Bioactive glasses in the Na2O- CaO- SiO2-P2O5 and MgO- CaO- SiO2- P2O5 system were prepared as polished disks [1]. The primary aim of the project was to develop better bio-glass-ceramics, which are bio-chemically compatible and non-toxic and to study the effect of doping agent on the physic-chemical properties of 45S5 bioactive glass [2] , so that the end material should be bio-mechanically compatible in their mechanical harmonization with surrounding tissue, and bio-adhesive in their adhesion between the material and living tissues [3,4]. Generally, when a glass ceramic is chemically attacked, the initial effect is upon the glassy phase present. So by the addition of cerium oxide in the phosphate glass, the effects of it on chemical durability (dissolution) and mechanical properties through the analysis of glass sample using DTA, TGA, XRD, FTIR, density measurement, compressive strength measurement.

1. Introduction

Hench &Paschall [1,5] used a glass with soluble additives and called it bio-glass. According to their report insertion of this material into the bone, where it is soluble in body fluids, resulted in the silica gel formation around the bio-glass and promoted collagen formation.June Wilson et al. [6] had studied the toxicology and biocompatibility of 45S5 and 45S5F bio-glasses. In vitro test were carried out in Rat bone cells, rat fibroblasts, human lymphocytes, chick fibroblasts, mouse macro phases. U.Gross and his colleagues [9] had carried out bio-compatibility test with two glasses consisting of SiO_2, Na_2O, CaO, $Ca_3(PO4)_3$, MgO, K2O and SiO^2, $Ca(PO_3)2$, Na_2O, CaO systems[8]. The test carried on pigs, rats and human were observed to show astonishing similarity in tissue reaction of different species.Ceramics

*Research Scholar,Department of Ceramic Engineering (Institute of Technology) Banaras Hindu University Varanasi (U.P.) India. e-Mail : ajay_ietk67@rediffmail.com

used for the repair and reconstruction of diseased or damaged part of the musculoskeletal system, termed bioceramics, may bioinert (alimina, zirconia), restorable (tri-calcium phosphate), bioactive (hydroxyapatite, bioactive glasses and glass ceramics),or porous for tissue in growth(hydrxyapatite-coated metals ,alumina)[10,11].

The bioactive glasses can be employed to repair and to rebuild damaged tissues, particularly hard tissues[11]. One point that differentiates them from other bioactive ceramics or glass-ceramic is the possibility to tailor a great chemical range of properties and of linking speed to the tissues[12]. Therefore is it possible to design glasses with tailored property for a specific clinical application. The bioactive glasses can be produced with the conventional technologies of the glass industry, but it is necessary to verify the purity of the row materials, to avoid the contamination by impurity and the loss of volatile elements, like Na_2O or P_2O_5. The different phases of production, so like the choice of the raw materials, influence the final features of the piece. The bioactive glasses are soft glasses and therefore the final shape can be easily given with conventional tools.[13]. The base components are usually SiO_2- Na_2O-CaO-and $_{P2}O_5$. In table 1.1 are restored the composition (percentages in weight) of the most common bioactive glasses. The most studied of these is the Bioglass 45S5. The abbreviation indicates that it contains 45 % in weight of SiO_2 (oxide creator) and the molar rate between Ca and P is of 5:1. Glasses with significantly lower molar rate (in the form of CaO and P_2O_5) don't generate connections with the bone [14,15].

2. Material and Methods

2.1 Materials Used

Fine-grained quartz was used as the source of silica, while Sodium Carbonate (Na_2CO_3), (Assay 99.9%); Calcium Carbonate ($CaCO_3$), (Assay 99%); Ammonium Dihydrogen Ortho Phosphate (NH4H2PO4), (Assay 99%); Boric Acid (H_3BO_3), (Assay 99.7 %); Potassium Carbonate (K_2CO_3), (Assay 99%); Lithium Carbonate (Li_2CO_3), (Assay 99%); Magnesium Carbonate($MgCO_3$), (Assay 99%); was the source of Sodium Oxide (Na_2O); Calcium Oxide (CaO); Phosphorus Pentaoxide (P_2O_5); Boron Trioxide (B_2O_3); Potassium Oxide (K_2O); Lithium Oxide (K_2O); Magnesium Oxide (MgO) respectively[17,18].

2.1 Method of Synthesis

For synthesis of bioactive glasses proper amounts of materials used are weighed using an Electronic Balance and mixed homogeneously in an Agate Mortar with an Agate Pestle. Premixed batch is melted in Platinum Crucibles, at 1400°C, for 3 hours using Globar Furnace. Sample is cast in Aluminum Molds, and annealed at 500°C for 4 hours using an Annealing Furnace.

3. Experimental Methods

3.1 Batch making

Composition Selection
Formula- (45S5-X)+XMgO X=0.5,2,3,4,6,8
45S5 Composition
($45SiO_2$, $24.5Na_2O$, 24.5CaO, $6P_2O_5$wt %)

3.2 Preparation of Glass powder

Four different types of doped glasses were prepared, and as reference, a glass with the composition corresponding to Bioglass_ 45S5 (hereafter as BG) was also prepared, as reported in Table 1. About 100 g of batch were prepared by mixing reagent grade Na_2CO_3, $CaCO_3$, $Na_3 PO_4$ $12H_2O$, SiO_2 and MgO, raw materials in a sealed polyethylene bottle for 1 h. Premixed batches were put into a 50 ml alumina crucible and melted in an electric oven for 1 h at 1400 ºC; the samples with MgO (0.5% and 3.2%) were melted at 1400ºC for 1 h and re-melted for 3 h (to ensure the homogeneity of the material). The sample with 2% of MgO was respectively melted at 1400 ºC for 1 h (re-melted for 3 h) and 4h. The melts were poured, crushed and sieved through 25 mesh screen to produce fine particles[21,22,23].

The procedure for the fabrication of bioactive glasses can be briefed as below:

1. Raw material was taken in the required proportion and was mixed for at least three hours.
2. It was kept in an alumina crucible as well as it was placed in the furnace and was heated under controlled program.
3. The temperature of the furnace was increased at the rate of 5ºC/minute. The maximum temperature was varied in between 1350ºC to 1400ºC.
4. The time for melting was maintained in between 2 to 4 hours.
5. It was followed by pouring, annealing and controlled cooling to remove the stress and strain of the glass

T A B L E No 1 *Experimental compositions of the examined glasses (wt %)*

	BG-1	BG-2	BG-3
MgO		1.00	2.00
SiO_2	45.0	45.0	45.0
Na_2O	24.5	24.5	24.5
CaO	24.5	23.5	22.5
P_2O_5	6.0	6.0	6.0

BG——————————— Bio-glass sample

Composition of Sample

BG-1 - 45 SiO_2- 24.5CaO- 24.5Na_2O-6P_2O-1MgO

BG-2 - 45 SiO_2-22.5CaO-24.5Na_2O- 6P_2O_5-2MgO

4. Results and Discussion

4.1 Differential Thermal Analysis Result

Any physical or chemical change occurring to the test sample, which involves the evolution of heat, will cause its temperature to rise temporarily above that of reference sample leading to an exothermic peak. Conversely, a process, which is accompanied by the absorption of heat, will cause the temperature

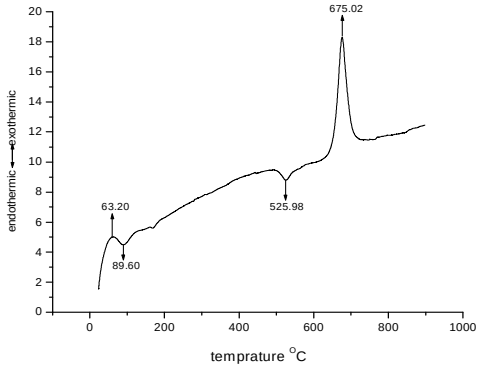


Figure 1 *DTA of 45 SiO_2-23.5CaO- 24.5Na_2O-6P_2O_5-1MgO Bio-glass sample no.1*

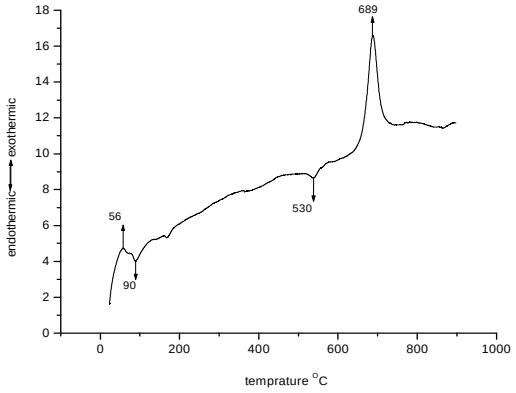


Figure 2 *DTA of 45 SiO_2-22.5CaO- 24.5Na_2O-6P_2O_5-2MgO Bio-glass sample no.2*

of the test sample to lag behind that of the reference sample, leading to an endothermic peak. The area under any given peak can be used as a quantitative measure of the amount of heat evolved or absorbed by the physical or chemical changes, which has occurred.

4.2 Outcomes Based on The Test Of DTA

The curves presented in the above figures shows exothermic peaks for different compositions of SiO_2-CaO- Na_2O-P_2O_5-MgO glass with varying MgO /CaO ratios[1,18]. The glass transitions temperature have been marked in the figures for respective glasses and they have been present against the composition of the glass. The variation in the Tg point with composition of the glass shows the structural changes taking place in the glass[20]. It also reveals the extent of interaction of oxygen legands with ions of iron in the glass. The variation in the exothermal peaks dictates the change in the nature of the glass with change in concentration of CaO at the cost of MgO. Further it is evident from the exothermic peaks that the crystallization in the glass takes place with the evolution of heat from the glass. The system changes during crystallization from a thermodynamically non-equilibrium state to an equilibrium state .The bioglass ceramics becomes a composite matrix which is formed during controlled crystallization where P_2O_5 acts as a nucleating agent in the glass. Lower the glass transition temperature lower would be its crystallization temperature and higher the glass transition temperature higher would be the crystallization temperature. Therefore for scientific and technical purpose glasses are melted correspondingly at higher temperature in view their liquidus temperature. So, it is mentioned here with that the glass transition temperature varies with the addition of MgO for CaO and P_2O_5 in the glass.

4.3 Density Measurement

T A B L E No.2 *Density of different bioactive glass samples*

Sr. No.	Glass Composition (mole%)	MgO/CaO	MgO/ P_2O_5	Density(gm/cc)
1	$45SiO_2 24.5Na_2O 24.5CaO.6P_2O_5$	0	0	2.74
2	$45SiO_2 23.5Na_2O 23.7CaO.6P_2O_5$ 1MgO	0.02	0.08	2.76
3	$45SiO_2 22.5Na_2O 24.0CaO.6P_2O_5$ 2MgO	0.08	0.34	2.81

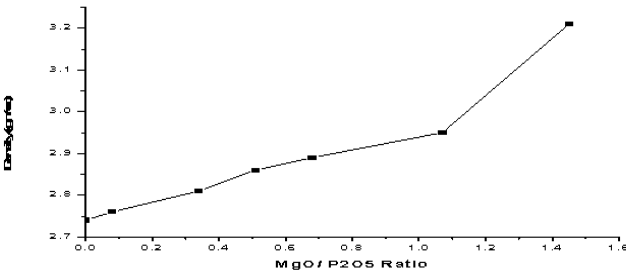


Figure.3 V*ariation of density of the glass with its MgO/ P_2O_5 Ratio*

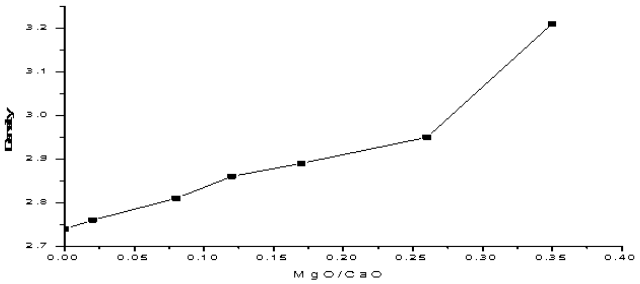


Figure4: *Variation of density of the glass with its MgO/ CaO Ratio*

4.4 Outcomes Based on The Result Of Density Mesurment

It is evident from fig.3 and fig.4 and table 2 that the density of the glass has increased with an increase in MgO/CaO ratio and ratio MgO/P2O5 in the 45S5 bioactive glasses.It indicates that the replacement

of a smaller Ca2+ ion by a heavier Mg ion increases the density of the glass and the system is closely packed

4.5 Compressive Strength

T A B L E No 3 *Compressive Strength of different Bio active glass samples*

Sr.No.	Glass Composition (mole %)	MgO/CaO	MgO/ P_2O_5	CompressiveStrength (M.Pa)
1	$45SiO_2 24.5Na_2O 24.5CaO.6P_2O_5$	0	0	155
2	$45SiO_2 24.5Na_2O 23.5CaO.6P_2O_5.1MgO$	0.02	0.08	160
3	$45SiO_2 24.5Na_2O 22.5CaO.6P_2O_5$ 2MgO	0.08	0.34	176

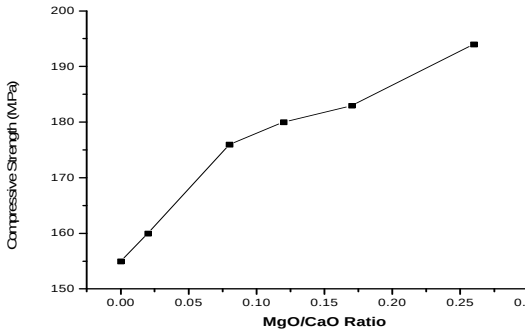


Figure: 5 *Variation of compressive strength with MgO/CaO Ratio*

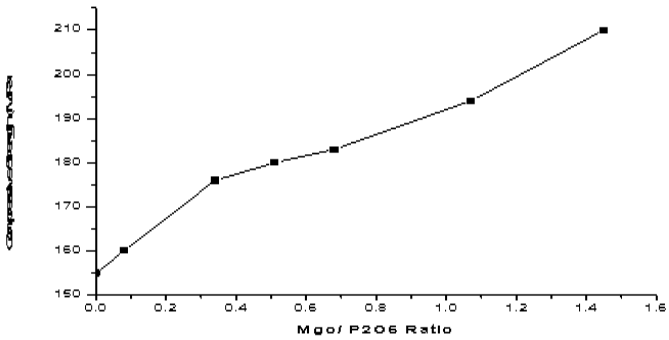


Figure 6 *Variation of compressive strength with MgO/P_2O_5 Ratio*

4.6 Outcomes Based on The Result Of Compressive Strength

It is evident from fig.5 and fig.6and table 3 that the compressive strength of the bio glass has increased with an increase in MgO/CaO ratio and ratio MgO/P_2O_5 in the 45S5 bio active glasses

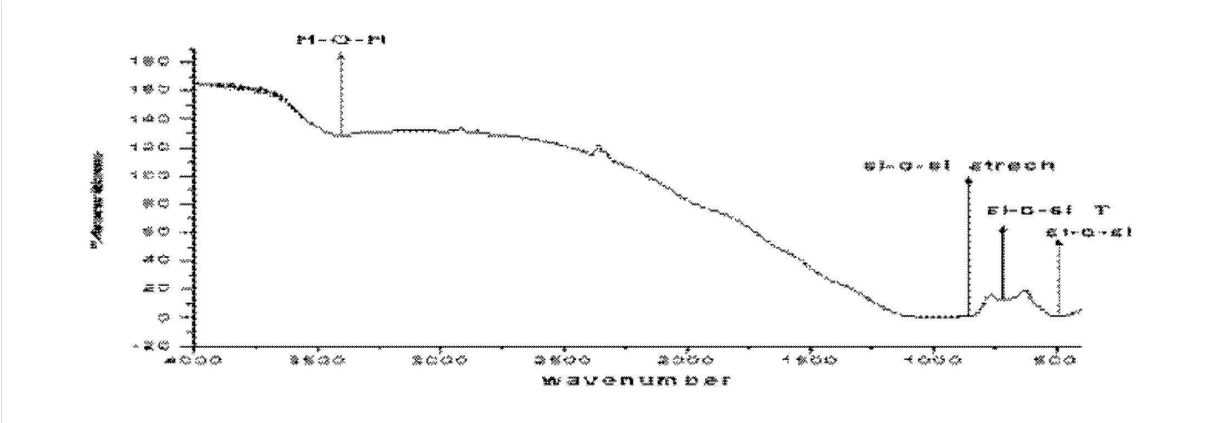


Figure7 *FTIR Spectra of 45 SiO_2-23.5CaO- 24.5Na_2O-6P_2O_5-1MgO Bio-glass before SBF for sample no 1*

4.7 Fourier Transform Infrared Spectroscopy (FTIR) Experiment for Different Sample

With the help of Fourier-Transform infrared Spectroscopy (FTIR) analysis, information about the structure of synthesized bioactive glasses is recorded.

To analyze the structure of synthesized bioactive glasses a quantity of all the bioactive Glasses is to grinded with potassium bromide finely (to remove scattering effects from large Crystals), used as a reference. This powder mixture is crushed in a mechanical die press to Form a translucent pellet through which the beam of the FTIR can pass. The infrared spectra of all the pellets are collected by using FTIR.

T A B L E No.4 *FTIR Transmission Bonds ofBio-glass 45 SiO_2-23.5CaO- 24.5Na_2O-6P_2O_5-1MgO for sample no. 1*

Serial. no.	Wavenumber(cm-1)	Modes of Vibration	bonds
1	3432	strech	H-O-H
2	830	strech	SI-O-SI
3	690	bend	SI-O-SI
4	495	bend	SI-O-SI

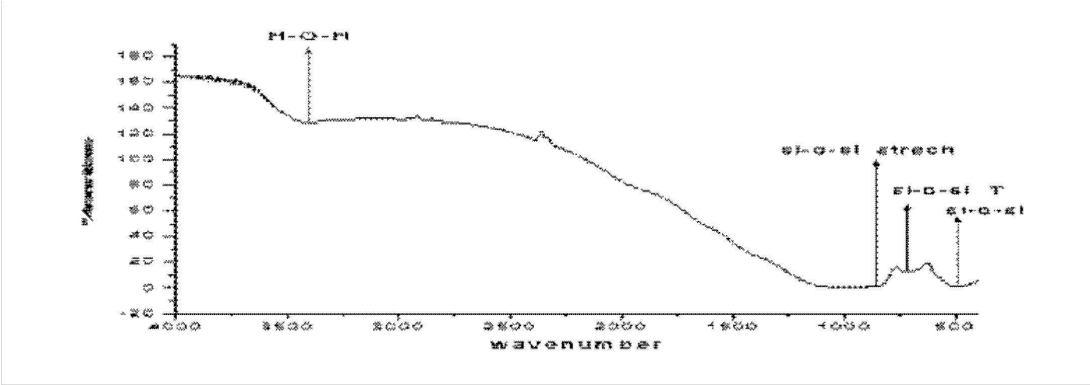


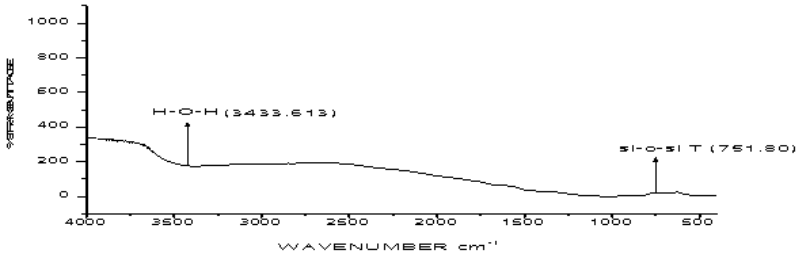
Figure 8 *FTIR Spectra of 45 SiO_2-22.5CaO- 24.5Na_2O-6P_2O_5-2MgO Bio-glass before SBF for sample 2*

T A B L E No.5 *FTIR Transmission Bonds of 45 SiO_2-22.5CaO- 24.5Na_2O-6P_2O_5-2MgO Bio-glass before SBF for sample no.2*

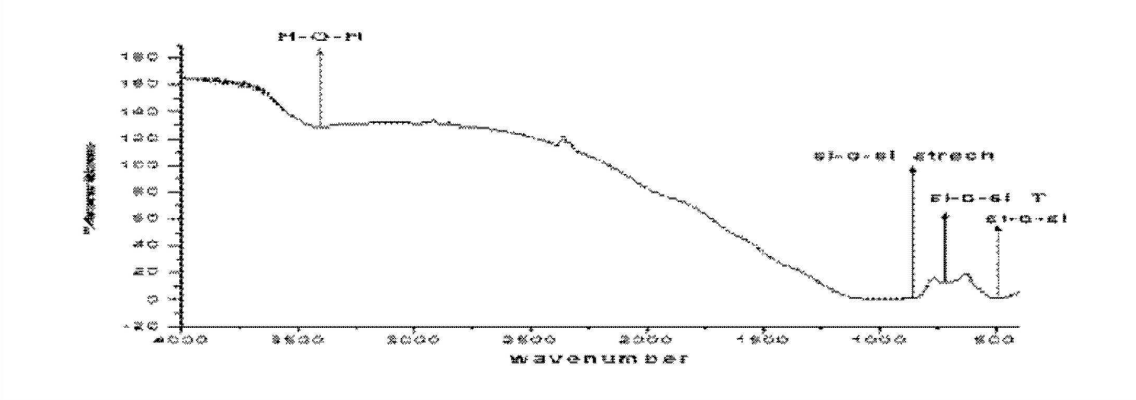
Serial no.	Wave number(cm-1)	Modes of Vibration	bonds
1	3428	strech	H-O-H
2	1052	strech	SI-O-SI
3	948	strech	SI-O-SI
4	723	bend	SI-O-SI
5	496	bend	SI-O-SI

FTIR reflection spectra of the surface of the bio-glass ceramic sample after reaction with SBF for various periods.The specimens BG-1, BG-2were soaked in an cellular simulated body fluid (SBF,100ml) with ion concentration and ph nearly equal to those of human blood plasma. The SBF was prepared according to Kokubo et al. by dissolving reagent grade NaCl, NaHCO3,KCl, K2HPO4.3H2O, MgCl2.6H2O, CaCl2 and Na2SO4 in an ion exchanged water contained in a polystyrene bottle[16]. These reagents were added in the order they are listed. The solution was buffered at pH value 7.25 with 50 mM of trishydroxymethyl-aminomethane (CH2OH) 3 CNH2 hereafter as TRIS) and 45 mM hydrogen chloride and its temperature was kept at 37 C.The soaking was carried out at 37 C, under continuous stirring and for various times (1, 5 and 10 days).

After SBF 1 day



After SBF 5 days



After SBF 10 day

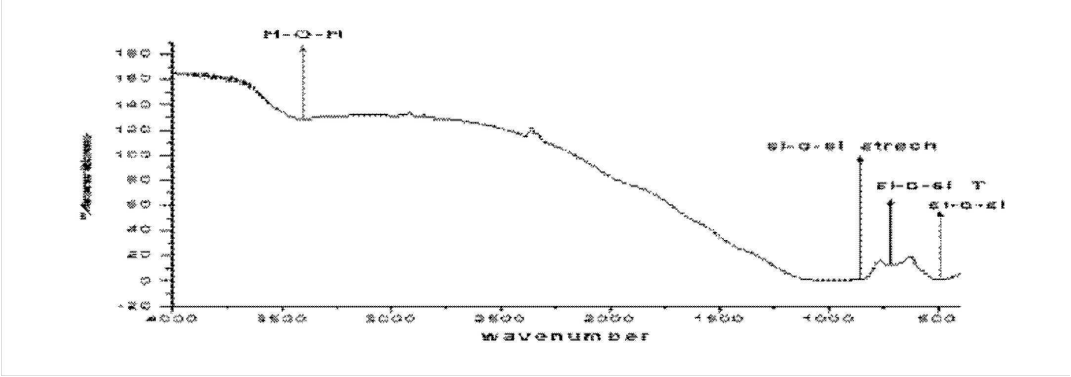


Figure 9 *FTIR Spectra of 45 SiO_2-23.5CaO- 24.5Na_2O-6P_2O_5-1MgO Bio-glass after SBF for Sample no.1*

"FTIR Transmission Bonds of 45 SiO_2-23.5CaO- 24.5Na_2O-6P_2O_5-1MgO Bio-glass after SBF treatment for sample no.1"

T A B L E No. 6 *SBF After 1 day*

Serial no.	Wave number(cm-1)	Modes of Vibration	bonds
1	3434	strech	H-O-H
2	752	strech	Si-o-si

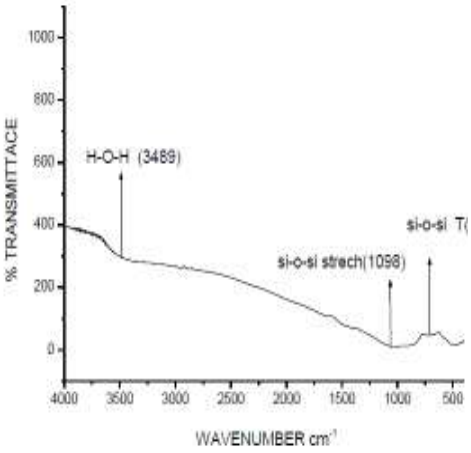
T A B L E No. 7 *SBF After 5 day*

Serial no.	Wave number(cm-1)	Modes of Vibration	bonds
1	3379	bend	H-O-H
2	1025	strech	Si-o-si
3	497	strech	Si-o-si

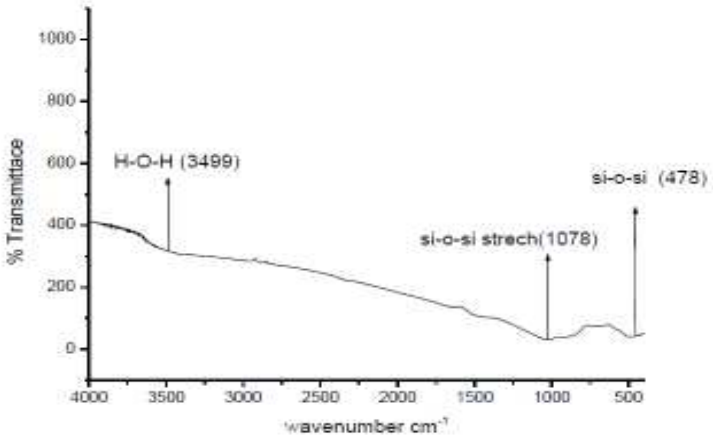
T A B L E No. 8 *SBF After 10 day*

Serial no.	Wave number(cm-1)	Modes of Vibration	bonds
1	3485	strech	H-O-H
2	1433	strech	p-o
3	540	strech	Si-o-si

Day 1



Day 2



Day 10

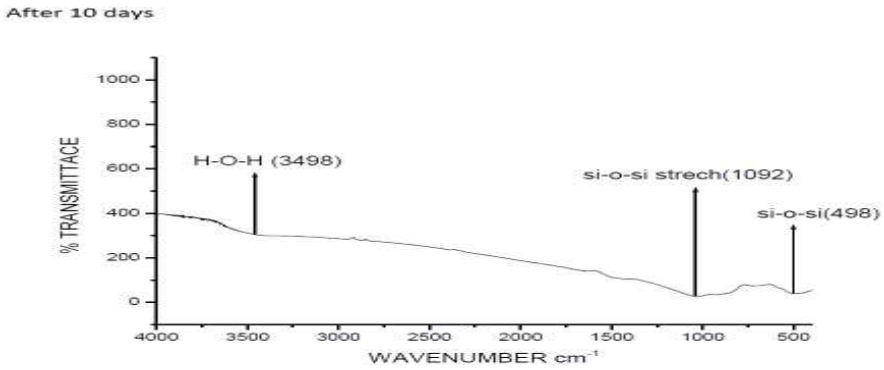


Figure 10 *FTIR spectra of 45 SiO_2-22.5CaO- 24.5Na_2O-6P_2O_5-2MgO Bio-glass Sample no.2*

"FTIR Transmission Bonds of 45 SiO_2-22.5CaO- 24.5Na_2O-6P_2O_5-2MgO Bio-glass sample no.2"

T A B L E No. 9 *SBF After 1 day*

Serial no.	Wave number(cm-1)	Modes of Vibration	bonds
1	3489	strech	H-O-H
2	1098	strech	Si-o-si
3	729	strech	Si-o-si

T A B L E No. 10 *SBF After 5 day*

Serial no.	Wave number(cm-1)	Modes of Vibration	bonds
1	3499	strech	H-O-H
2	1078	strech	Si-o-si
3	478	strech	Si-o-si

T A B L E No. 11 *SBF After 10 day*

Serial no.	Wave number(cm-1)	Modes of Vibration	bonds
1	3498	strech	H-O-H
2	1092	strech	Si-o-si
3	498	strech	Si-o-si

4.8 Outcomes Based on The Test Of FTIR

The IR spectra above fig. after 1 , 5 and 10days in SBF were markedly changed in the case of BG-1 and BG-.2 Mg the bands due to Si–O–Si group were still present, although very weak, indicating the polymerization of the Si–OH groups formed in the initial stages o fraction as a results of the ion exchange with H^+ of the solution. In addition we observed new bands in the spectral region typical of p–O and p–O vibrations in agreement with the presence of crystalline apatite revealed by XRD techniques. The spectra of BG-1, and BG-2 Mg showed lower modifications and still showed the bands assigned to Si–O (2NBO) and Si– O (NBO) and bands assignable to the P–O vibrations of an apatite crystalline phase were not detected. On the basis of the position of these bands we may propose that in these cases the original glass structure was maintained.

The glasses containing 10 weight % CaO with varying MgO /CaO ratios show analogous FTIR absorption characteristics. The band centered near 500 cm^{-1},and 3500 cm^{-1} in these glasses are assigned to stretching mode of two non bridging oxygen atoms which are bonded to phosphorous atoms as O=P=O in PO_4^{3-} tetrahedral and si-o-si. The bonds near 1439 cm^{-1} and 1430 cm^{-1} have been assigned to P-O^-groups.The P-O^{--} absorption bands near 586cm^1 shift towards lower frequencies at around 509 cm^{-1} as Mgo replaces P_2O_5 in the glass .The band near 1448 cm^{-1} as attributed to PO_3 groups tends to decrease with increasing substitution of Mgo. Absorption bands near 1448 cm^{-1} and 509 cm^{-1} are assigned to the asymmetric and symmetric stretching modes of O=P=O linkage respectively .

7.5 X-Ray analysis of glass samples

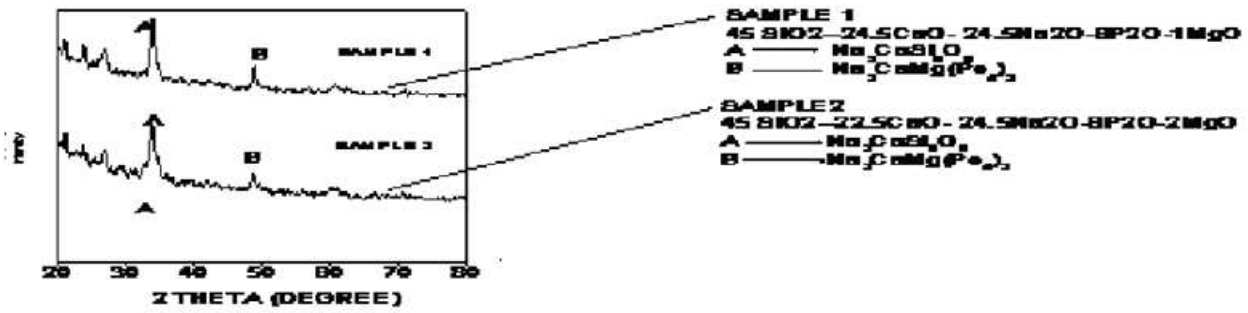


Fig. 13 *XRD peak for 45S5 magnesium Doped bio-glass sample after sintering at 800c°*

4.9 Outcomes Based on The Test Of XRD

XRD patterns of bioactive glass ceramic show the presence of two main crystalline phase of sodium calcium silicate (Na2 Ca Si3 O8 , Na2 Ca Si3 O9).Introduction of MgO leads to the formation of new crystalline phase of sodium calcium magnesium phosphate (Na2 Ca Mg(Po4))2. It dictates that all the SiO2- Na2O-CaO-P2O5 and MgO Doped 45S5 glass samples have been melted properly and converted into crystalline phase.

Conclusions

- The formation of magnesium-containing phosphosilicate glasses is obtained until addition of 2% of MgO. The addition of small quantities of MgO up to 1% to Bio-glass 45S5 does not alter significantly its ability of in vitro apatite formation within few days of immersion in SBF. High magnesium content improves the chemical durability of glasses so the reactivity is negatively affected and magnesium -containing phosphates seem to be preferred with respect to calcium containing ones. The improvement of glass durability is ascribed to the degree of covalent character of Mg–O bond and the hydrolytic dissociation is difficult. The apatite formation is prevented both by glass durability and by magnesium ability to interact with phosphate giving rise to an amorphous phase. The magnesium concentration is always extremely low and the ion is immobilized in a solid phase.
- Increasing the MgOfrom 0-2 mole % causes an increase in density as well as compressive strength of the bio-glass
- Sharp peak was found. So the prepared bio-glass samples were crystalline in nature.
- Absorption bands of O-H and P-O reflecting the vibrations of OH and PO_4 groups in the bio-glass sample have been found at different wave numbers.
- Introduction of MgO leads to the formation of new crystalline phase of sodium calcium magnesium phosphate ($Na_2CaMg(PO_4)_2$).

References

[1] L.L. Hench, R.J. Splinter, W.C. Allen, T.K. Greenlee Jr.,J. Biomed. Mater. Res. 2 (1972) 117.

[2] [2] L.L. Hench, J. Am. Ceram. Soc.74(1991) 1487, and references therein.

[3] U. Gross, R. Kinne, H.J. Schimit, V. Strunz, CRC Crit.Res. Biocompatible. 4(1988)

[4] H.M. Kim, F. Miyaji, T. Kokubo, J. Am. Ceram. Soc. 78(1995) 2405, and references therein.

[5] T. Kokubo, M. Shigematsu, Y. Hagashima, T. Tashiro, T.Nakaura, T. Yamamuro, H. Higashi, Bull. Inst. Chem.

[6] G.H. Beall, K. Chyung, H.J. Watkins, Fluormica Glass-Ceramics, 1974, US Patent US-PS 3,801, 295 April 2.

[7] W. Vogel, W. Holland, K. Neumann, J. Gummel, J. Non- Cryst. Solids

[8] P. Stoor, E. S•oderling, J.I. Salonen, Acta Odontol. Scan

[9] N. Irving Sax, R.J. Lewis Sr., in: Dangerous Properties of Industrial Materials, 7th Ed., vol. 2, Van Nostrand

[10] Hench LL, Splinter, RJ, Allen WC, Greenlee TK. Bonding mechanisms at the interface of ceramic prosthetic materials. J. Biomed. Mater. Res. Symp.1971; 2 (Part I): 117–141

[11] Wilson J, Nolletti D. In Handbook of Bioactive Ceramics. Yamamuro T, Hench LL, Wilson J Editors. CRC Press, Boca Raton, FL. 1990: 283.

[12] Hench LL. In Bioceramics: Materials characteristics versus in-vivo behavior. Annals of New York Acad. Sci. New York 1998; 523: 54.

[13] *Black J. Biological Performance of Materials:* Fundamentals of Biocompatibility. Marcel Dekker, New York, 1992.

[14] Rho J, Kuhn-Spearing L, Zioupos P. Mechanical Properties and the Hierarchical Structure of Bone. Med. Eng. Phys. 1998; 20: 92-102.

[15] *Spence A. Basic Medical Anatomy.* Benjamin/Cummings 1990.

[16] Van Lenthe GH, Willems MMM, Verdonschot N, de Waal Malefijt MC, Huiskes R.Stemmed femoral knee prostheses. Effects of prosthetic design and fixation on bone loss.Acta Orthop Scand 2002; 73: 630–637.

[17] Van Lenthe GH, Waal Malefijt MC, Huiskes R. Stress shielding after total knee replacement may cause bone resorption in the distal femur. J Bone Joint Surg (Br) 1997; 79: 117-22.

[18] Ramakrishna S, Mayer J, Wintermantel E, Leong WK. Biomedical applications of polymercomposite materials: a review. Compos. Sci. Technol. 2001; 61: 1189-1224.

[19] San Millan RD, Burkhardt K, Jean B, Muster M, Martin JB, Bouvier J, Fasel JHD, Rufenacht DA, Kurt AM. Pathology findings with acrylic implants. Bone. 1999: 25: 85S-90S.

[20] *Carlisle EM. In: Silicon Biochemistry.* Wiley, New York, 1986. p. 123-136.

[21] JUNE WILSON, G.H.PIGOTT, F.J.SCHOEN & L.L.HENCH, J.Biomed. Marer. Res., 15,805-817(1979).

[22] DE GROOT K. Ceramic of calcium phosphates: preparation and properties. In Bioceramics of calcium phosphate, ed. K de Groot. CRC press, Boca Raton, FL.

[23] PASTERIS JD, WOPENKA B, FREEMAN JJ, ROGERS K, VALSAMI-JONES E, VAN DER HOUWEN JAM, SILVA MJ, Lack of OH in nanocrystalline apatite as a function of degree of atomic order:implications for bone and biomaterials. Biomaterials 2004; 25: 229 –238.

Note for Contributors

SUBMISSION OF PAPERS

Contributions should be sent by email to Dr. Maneesha Shukla Editor-in-Chief, Anvikshiki, The Indian Journal of Research (maneeshashukla76@rediffmail.com). www.onlineijra.com

Papers are reviewed on the understanding that they are submitted solely to this Journal. If accepted, they may not be published elsewhere in full or in part without the Editor-in-Chief's permission. Please save your manuscript into the following separate files-***Title; Abstract; Manuscript; Appendix.*** To ensure anonymity in the review process, do not include the names of authors or institution in the abstract or body of the manuscript.

Title**:** This title should include the manuscript, full names of the authors, the name and address of the institution from which the work originates the telephone number, fax number and e-mail address of the corresponding author. It must also include an exact word count of the paper.

Abstract**:** This file should contain a short abstract of no more than 120 words.

MANUSCRIPT: This file should contain the main body of the manuscript. Paper should be between 5 to 10 pages in lenth,and should include only such reviews of the literature as are relevant to the argument. An exact word count must be given on the title page. Papers longer than 10 pages (including *abstracts, appendices and references*) will not be considered for publication. Undue length will lead to delay in publication. Authors are reminded that Journal readership is abroad and international and papers should be drafted with this in mind.

References should be listed alphabetically at the end of the paper, giving the name of journals in full. Authors must check that references that appear in the text also appear in the References and *vice versa.* Title of book and journals should be italicised.

Examples**:**

BLUMSTEIN,A.and COHEN,J.(1973),'A Theory of Punishment' *Journal of Criminal Law and Criminology,*64:198-207

GUPTA,RAJKUMAR(2009),*A Study of The Ethnic Minority in Trinidad in The Perspective of Trinidad Indian's Attempt to Preserve Indian Culture,* India: Maneesha Publication,

RICHARDSON,G(1985),Judicial Intervention in Prison Life', in M. Maguire ,J. Vagg and R. Morgan, eds., *Accountability and Prisons,*113-54.London:Tavistocs.

SINGH,ANITA.(2007),*My Ten Short Stories,*113-154.India:Maneesha Publication.

In the text,the name of the author and date of publication should be cited as in the Harvard system(e.g.Garland 1981: 41-2;Robertson and Taylor 1973;ii.357-9)If there are more than two authors, the first name followed by *et al.* is manadatory in the text,but the name should be spelt out in full in the References. Where authors cite them as XXXX+date of publication.

Diagrams and tables are expensive of space and should be used sparingly. All diagrams, figures and tables should be in black and white, numbered and should be referred to in the text.They should be placed at the end of the manuscript with there preferred location indication in the manuscript(e.g.Figure 1 here).

Appendix: Authors that employ mathematical modelling or complex statistics should place the mathematics in a technical appendix.

NOTE : Please submit your paper either by post or e-mail along with your photo, bio-data, e-mail Id and a self-addressed envelop with a revenue stamp worth Rs.51 affixed on it. One hard copy along with the CD should also be sent.A self-addressed envelop with revenue stamp affixed on it should also be sent for getting the acceptance letter. Contributors submitting their papers through e-mail, will be sent the acceptance letter through the same. Editorial Board's decision will be communicated within a week of the receipt of the paper. For more information, please contact on my mobile before submitting the paper. All decisions regarding members on Editorial board or Advisory board Membership will rest with the Editor. Every member must make 20 members for Anvikshiki in one year. For getting the copies of 'Reprints', kindly inform before the publication of the Journal. In this regard, the fees will be charged from the author.

" After submission, the manuscript is reviewed by two independent referees. If there is disagreement between the referees , the manuscript is sent to third referee for review. The final decision is taken by the Editor in chief".

Search Research papers of The Indian Journal of Research Anvikshiki-ISSN 0973-9777 in the Websites given below

http://nkrc.niscair.res.in/BrowseByTitle.php?keyword=A

National Knowledge Resource Consortium

www.icmje.org

ICMJE INTERNATIONAL COMMITTEE of MEDICAL JOURNAL EDITORS

www.scholar.google.co.in

Google scholar

www.kmle.co.kr

KMLE 의학 검색 엔진
Korean medical library engine
http://www.kmle.co.kr

www.fileaway.info

File Away

www.banaras.academia.edu

Academia.edu
follow research

www.www.edu-doc.com

Edu-Doc

www.docslibrary.com

docslibrary
Search Any Document Files Over The Internet!

www.dandroidtips.com

MyCelular.ORG

www.printfu.org

pdf search engine
ARTAPP.NET

www.cn.doc-cafes.com

DOC CAFES

www.freetechebooks.com

Tech eBooks

www.google.com

Google India

IJRA

ISSN 0973-9777
09739777
₹ 1600/-