

KaSAM-2018 POSTER PRESENTATION: SATURDAY, OCTOBER 27, 2018 (Time: 15:10 – 18:00)

Subject to change !

Poster No.	Title of poster & author(s)
1	Satoshi Sasayama (Department of Oral Implantology, Osaka Dental University, Osaka, JAPAN) Osteogenesis of multipotent progenitor cells on vacuum-heated epigallocatechin-modified gelatin sponge
2	Priyanka Solanki (The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, INDIA) Camptothecin encapsulated in SBA-15: synthesis, characterizations and <i>in vitro</i> controlled release study
3	Yoshitomo Honda (Osaka Dental University, Osaka, JAPAN) Vacuum-heated epigallocatechin gallate-modified gelatin sponges as a novel material for bone tissue engineering
4	Deependra Das Mulmi (Faculty of Science, Nepal Academy of Science and Technology, Lalitpur, NEPAL) Lysozyme mediated TiO₂ nanoparticles for photocatalytic applications
5	Pankaj Boruah (Indian Institute of Technology Guwahati, Kamrup-781039, Assam, INDIA) Enhanced degradation of oil droplets using biopolymer as dispersant for oil spill treatment
6	Eiki Hara (Department of Orthodontics, Osaka Dental University, Hirakata, Osaka, JAPAN) Quality of regenerated bone induced by vacuum-heated epigallocatechin gallate-modified gelatin sponge
7	Jakub Sirc (Institute of Macromolecular Chemistry, Czech Academy of Sciences, Prague, CZECH REPUBLIC) Polymeric bile acid sequestrants based on cyclodextrins
8	Rajesh Sadasivan (The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, INDIA) Mono-copper substituted phosphotungstate supported on zirconia: synthesis, characterization and oxidation of alkenes using TBHP
9	Tomoya Hara (Osaka Dental University, Osaka, JAPAN) Osteoinductive activity of rhBMP-2 with atelopeptide type I collagen
10	Santoshi Khatri (Central Department of Botany, Tribhuvan University, Kathmandu, NEPAL) Antioxidant and cytotoxic capacity of <i>Dendrobium crepidatum</i> stem extract and detection of bioactive compounds
11	Mamita Ghimire (School of Health and Allied Sciences, Pokhara University, Kaski, NEPAL) Phytochemical analysis of selected nepalese medicinal plants, screening for antioxidant activity and determination of total phenol and total flavonoid content
12	Parbhej Ahmed (Department of Chemistry, Khulna University of Engineering & Technology, Dhaka, BANGALADESH) Mg, Zn and Cu doped Li₄Ti₅O₁₂ for high power Li-ion batteries
13	Hiroshi Kono (Graduate School of Medical and Dental Sciences, Kagoshima University, Kagoshima, JAPAN) Effect of sintering conditions on mechanical properties of high translucent Zirconia
14	Arush Bhattarai, (Mahendra Morang Adarsh Multiple Campus, Biratnagar, Morang, NEPAL) <i>In vitro</i> antibacterial screening and physico-chemical properties study of branded toilet soaps of Nepal
15	Sanjaya Dahal (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Synthesis of red mud based geopolymers for the replacement of OPC
16	Amrita Sigdel, (Tri-Chandra Multiple Campus, Tribhuvan University, NEPAL) Utilization of biowaste (<i>Mangifera indica</i>) seed in manufacture of bioplastic reinforced with PVA using glycerol as plasticizer
17	Manita Khatri (Central Department of Chemistry, Tribhuvan University, Kirtipur, Kathmandu, NEPAL) Synthesis of TiO₂ nano-particles by green method to functionalize the fabrics
18	Ashwin Khadka (Department of Physics, Patan Multiple Campus, Tribhuvan University, Lalitpur, NEPAL) Reduced graphene oxide (RGO) integrated methyl ammonium lead halide perovskite photocell for reducing cost and improving stability
19	Bijay Basnet (Department of Chemical Science & Engineering, Kathmandu University, Kavre, NEPAL) Optical and thermal properties of solar thermal collectors from black nickel
20	Samit Poudel (School of Health and Allied Sciences, Pokhara University, Kaski, NEPAL) Phytochemical screening and evaluation of <i>in vitro</i> antioxidant activity of selected medicinal plants of Nepal
21	A. K. Sarangi (Department of Chemistry, Government College of Engineering, Odisha, INDIA) DFT, Cytotoxicity and molecular docking studies of (E)-2((2-hydroxybenzylidene) amino-3-mercaptopropanoic acid and its Co(II), Ni(II) and Cu(II) complexes

22	Subash Aryal (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Synthesis, characterization of CuO nanoparticles and study the mechanical properties of its urea-formaldehyde/CuO composite
23	Komal Prasad Malla (School of Health and Allied Sciences, Pokhara University, Kaski, NEPAL) Synthesis, size control and characterization of noble biomaterial hydroxyapatite from ostrich femur bones using calcinations at various temperatures
24	Rajendra Joshi (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Synthesis and characterization of Zirconium dioxide nanoparticles using <i>Azadirachta indica</i> leaf extract at different concentrations
25	Amrit Regmi (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Synthesis and microscopic study of Zinc Sulfide nanoparticles
26	Kamal Kapri (Amrit Campus, Tribhuvan University, Lainchour, Kathmandu, NEPAL) Synthesis, characterization and antimicrobial evaluation of 4-amino-5-(4-tert-butylphenyl)-4H-1,2,4-triazole-3-thiol derivatives
27	Roshan Khatri (Central Department of Chemistry, Tribhuvan University, Kirtipur, Kathmandu, NEPAL) Microstructural analysis of nettle fiber (<i>Girardia diversifolia</i>) as a function of processing conditions
28	Shreeya Lohani (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Synthesis and characterization of Zirconia nanoparticles using <i>Zingiber officinale</i> and investigate the microbial activity
29	Surendra Bikram Silwal (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Natural dye for solar cell and hair dyeing
30	Rojita Pote Shrestha (Central Department of Chemistry, Kirtipur, Kathmandu, NEPAL) An efficient zinc oxide adsorbent for the removal of hexavalent chromium
31	Sunita Rijal (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Study the effect of plasticizer, concentration of plasticizer in preparation and properties of starch based bio-film from banana peels
32	Aabha Puri (Department of Chemistry, Tri-Chandra Multiple Campus, Kathmandu, NEPAL) Synthesis and characterization of cellulose fiber from sabai grass and their phenol-formaldehyde composites
33	Babu Raj Dhungana (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Synthesis of eco-friendly composites of urea formaldehyde with allo and cotton fibers
34	Kabita Sharma (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Determination of some heavy metals present in different vegetables of Kavrepalanchok district
35	Muna Shrestha (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Properties of urea-formaldehyde-resin/cellulose composites
36	Shiraj Pokhrel (Central Department of Chemistry, Tribhuvan University, Kirtipur, Kathmandu, NEPAL) Preparation of conducting Nepali paper using multi walled carbon nanotubes
37	Shiva Raj Pathak (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, NEPAL) Synthesis and characterization of ZnO nanoparticles and investigate the mechanical properties urea-formaldehyde/ ZnO nanocomposite
38	Sunita Shah (Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu NEPAL) Synthesis and characterization of chitosan from prawn shells and study the effect of chitosan on weight loss of <i>Myrica Esculenta</i>
39	Sandipa Subedi (Research Centre for Applied Science and Technology,, Tribhuvan University, Kirtipur, NEPAL) Physiochemical characterization of some Ayurvedic Bhasma
40	Dinesh Chaudhary (Department of Physics, Amrit Campus, Tribhuvan University, Kathmandu, NEPAL) Influence of Fe doping into ZnO thin film for detection of ethanol vapor
41	Prakash Gautam (Central Department of Chemistry, Tribhuvan University, Kirtipur, Kathmandu, NEPAL) Biowaste reinforced degradable polymer composites: a review
42	Bhawana Khatri (Central Department of Chemistry, Tribhuvan University, Kirtipur, Kathmandu, NEPAL) Photocatalytic degradation of methyl orange by bismuth vanadate nanoparticles
43	Grishma Timilsina (Tri-Chandra Multiple Campus, Tribhuvan University, Ghantaghar, Kathmandu, NEPAL) Green synthesis and characterization of hematite (α-Fe₂O₃), nanoparticles and study antimicrobial activity

POSTER SESSION : Saturday October 27, 2018 (15:10-18:00)

1. Osteogenesis of multipotent progenitor cells on vacuum-heated epigallocatechin-modified gelatin sponge

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At present, there is no established bone regeneration method for treating extensive bone defects such as cleft lip and palate. More recently, we developed novel bone regeneration materials^{1,2}, such as vacuum-heated epigallocatechin gallate (EGCG)-modified gelatin sponge (vhEGCG-GS). Adiposederived stem cells (ADSC) and dedifferentiated fat (DFAT) cells as multipotent progenitor cells have the ability to differentiate into osteoblasts³. However, excellent scaffolds for the seeding of both cell types for effective osteogenesis have yet to be developed. In this study, to develop promising cell seeding scaffolds for the treatment of extensive bone defects in the future, we evaluated the bone formation induced by the vhEGCG-GS or gelatin sponge (vhGS) combined with both cell types using a rat model of congenital cleft jaw. To prepare vhEGCG-GS, Type A gelatin derived from porcine skin was chemically modified with EGCG, freeze-dried, and vacuum-heated. The sponges were evaluated by scanning electron microscopy (SEM) and so on. Both types of cell were prepared from adipose tissue collected from the male F344 rats aged 8 weeks. Each sponge was implanted into the mandibular cleft (diameter: 2 mm; height: 4 mm) of 70 male rats aged 8 weeks; the osteogenic ability was estimated by the bone morphometry using micro CT and histological evaluation after 4 and 8 weeks. As the experimental groups, groups with each scaffold seeded with DFAT or ADSC were used. For the control, a non-implantation group and groups with vhGS or vhEGCG-GS alone were used. Additionally, we investigated the cell adhesion property using dsDNA assay, SEM, and immunofluorescent staining, and the calcium phosphate deposits on the scaffold in vitro. As a result, vhEGCG-GS with DFAT and ADSC showed greater bone forming ability than other groups. These results suggest that the vhEGCG-GS might be a promising cell-seeding scaffold usable for treating cleft lip and palate.

(Approved by the Ethical Committee of Animal Experiments in Osaka Dental University: Approval No. 17-03003) (Osaka Dental University Research Funds No. 18-10)

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2. Camptothecin encapsulated in SBA-15: synthesis, characterizations and in vitro controlled release study

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The clinical application of Camptothecin has some disadvantage like its extreme aqueous insolubility, low stability of the lactone form at physiological pH and severe systemic toxicities and lower stability which required more number of dosing [1]. The mentioned problems can be solved using suitable carrier which can deliver it in controlled manner as well as protect it and increase its stability as well as enhance its solubility. Towards this, mesoporous silica has gained importance as drug carrier [2].

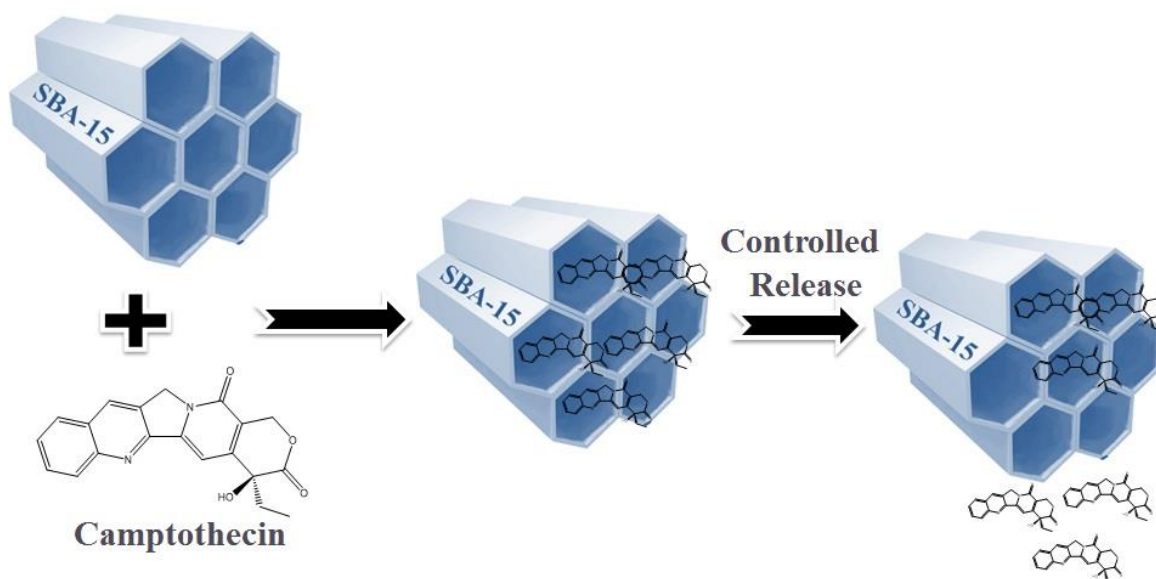


Figure 1. Schematic representation of Camptothecin loading and release.

The present paper describes synthesis of SBA-15, encapsulation of Camptothecin into SBA-15 and their characterizations using various physicochemical techniques. In vitro release study of Camptothecin at body temperature under different condition (stirring and static) and at different pH was carried out. A study on drug release kinetic and mechanism was also carried out.

References

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3. Vacuum-heated epigallocatechin gallate-modified gelatin sponges as a novel material for bone tissue engineering

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Epigallocatechin-3-gallate (EGCG), a major green tea polyphenol, promotes osteoblastic differentiation of mesenchymal stem cells¹ and dedifferentiated fat cells² in vitro. This polyphenol is thought to be a promising agent for use in bone regenerative medicine. However, few studies have investigated its effects on bone regeneration in vivo. Thus, we hypothesized that 1) the poor bone-forming ability of EGCG in vivo is due to its low storability in the affected parts and 2) fabricating an EGCG-modified biocompatible polymer that enhances its storability might elicit a strong osteogenic ability of the polyphenol in vivo. Based on these hypotheses, we recently developed an EGCG-modified gelatin sponge (EGCG-GS)³ and proved its bone regeneration efficacy in vivo. However, the robustness of EGCG-GS was extremely poor, and thus, EGCG-GS could not be used as a scaffold for cells. Vacuum heating is known to enhance the degree of cross-linking and robustness of gelatin. In this study, we evaluated whether the vacuum-heated EGCG-GS (hereafter designated as vhEGCG-GS) exhibits superior bone-forming ability compared with that exhibited by EGCG-GS in vivo. vhEGCG-GS was fabricated using aqueous chemical synthesis methods, followed by lyophilization and vacuum heat treatment. EGCG-GS and vacuum-heated gelatin sponges without EGCG (vhGS) were used as controls. The characteristics of sponges was assessed by scanning electron microscopy, and Fourier-transform infrared spectroscopy. Each sponge was implanted into critical-sized defects of calvaria (diameter: 9 mm) in 8-week-old male rats. The osteogenic ability of the sponges was estimated by bone morphometry using microcomputed tomography and histological evaluation after 4 weeks of implantation. The biodegradability and cell adhesion properties of the sponges were assessed in vitro. vhEGCG-GS showed greater bone-forming ability than did vhGS and EGCG-GS. These results suggest that vhEGCG-GS might be a promising material for use in bone regeneration.

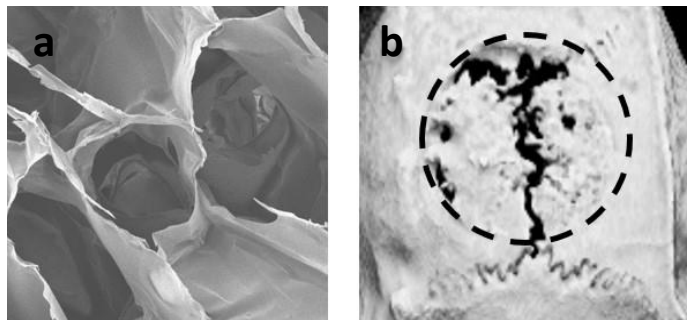


Figure 1. (a) Representative scanning electron microscopy image of vhEGCG-GS and (b) microcomputed tomography image on a critical-size defect of rat calvaria implanted with vhEGCG-GS (broken circle: prepared defect).

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3. Y. Honda, et al., Int. J. Mol. Sci. 2015, 16, 14143-14157.

4. Lysozyme mediated TiO₂ nanoparticles for photocatalytic applications

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Lysozyme mediated titanium dioxide nanoparticles (L:TiO₂) were synthesized through a facile synthesis. Structural, morphological and optical properties of L:TiO₂ were compared with synthesized TiO₂ nanoparticles. XRD pattern showed dominance of anatase phase in L:TiO₂ whereas rutile phase in TiO₂. Their grain size was reduced from 38 to 17 nm on using lysozyme. FTIR study revealed the existence of chemical bonding of Ti and O in both phases. The band gap energy was decreased from 3.3 to 3.1 eV on employing lysozyme. L:TiO₂ nanoparticles showed better performance in photo degradation of MB and MO under ultraviolet irradiation than TiO₂.

5. Enhanced degradation of oil droplets using biopolymer as dispersant for oil spill treatment

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Frequent oil spill accidents occur during its production, transportation and many other activities and even release of by products, such events pose a serious ecological and economic consequences. The extensive use of chemicals for oil spill treatment will induce toxicity and may impair aquatic population, in this regard there is a need to use a sustainable method for oil spill clean-up. To overcome this problem nanoamphiphilic modified chitosan (MCH) and Xanthan gum (XG) was used, where MCH acts as a bio-dispersant and XG enhances the viscosity of water bodies which leads to the improvement in stability of oil droplets. Application of these two materials produce a highly stable oil in water emulsion which has been proven by particle size analysis and optical microscope images, the results show that the emulsion remains stable for more than 20 days. Hydrophobic part of the MCH attached to the oil droplets and the presence of XG increases the viscosity of dispersed phase which restrict the movement of oil droplets. Microbial oil degradation studies elucidate that there is a significant degradation of hydrocarbons present in the crude oil within seven days and this can be observed from GC-MS analysis which shows higher degradation of oil as compared to oil without bio-dispersant. Thus, application of such biopolymers and modified bio dispersant reduces the toxicity of chemical dispersant that are being widely used for oil spill treatments.

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6. Quality of regenerated bone induced by vacuum-heated epigallocatechin gallate-modified gelatin sponge

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Introduction: Epigallocatechin gallate (EGCG), obtained from green tea, is known to have various pharmacological effects [1, 2]. However, little is known about its bone-forming ability and potential use in bone regenerative therapy. Our group has fabricated a new bone regenerative material using EGCG and gelatin3 (hereafter designated as EGCG-modified gelatin sponge: EGCG-GS). Gelatin was chemically modified with the EGCG using aqueous chemical synthesis method. More recently, we have demonstrated that the vacuum-heated (vh) EGCG-GS exhibited superior bone-forming capability compared with the EGCG-GS [4]. Nevertheless, the optimal mixing ratio of EGCG and gelatin in vhEGCG-GS is still unknown. The aim of this study was to investigate the effect of the mixing ratio of EGCG and gelatin on the quantity and quality of the regenerated bone induced by the sponges using a rat calvarial defect model. **Materials and method:** The EGCG-GS was prepared using the aqueous chemical synthesis method, lyophilization, and vacuum-heating technique. During the aqueous chemical synthesis process, to prepare a variety of vhEGCG-GSs, the different amounts of gelatin used were 0.01, 0.1, 0.5, 1.0, and 2.0 wt%, while EGCG was set at 0.0007 wt.-% (hereafter, the vhEGCG-GSs are designated as vhEGCG-GS [0.01 to 2.0]). The structure of vhEGCG-GSs was confirmed using a scanning electron microscope.

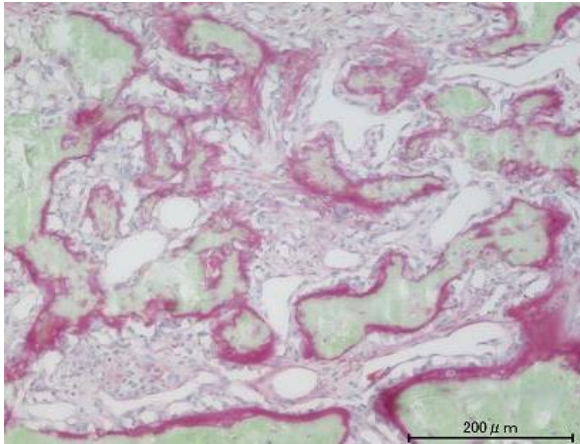


Figure 1. Represented osteoid formation in regenerated bone induced by vhEGCG-GS.

The bone-forming ability of the sponges was evaluated using microcomputed tomography analysis and histological evaluation (hematoxylin-eosin staining and V. Gordona staining). Rat calvarial defects (□□ mm diameter) were formed in the skulls of 8-week-old male rats; the sponges were implanted in the defects for 4 weeks. **Results and Discussion:** Increasing the amount of gelatin in the vhEGCG-GS enhanced bone formation in the defect. However, the regenerated bone induced by the vhEGCG-GS [2.0] was immature compared with that induced by vhEGCG-GS [0.5]. Given these results, the mixing ratio of gelatin and EGCG might affect the quality of regenerated bone induced by vhEGCG-GS.

References

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7. Polymeric bile acid sequestrants based on cyclodextrins

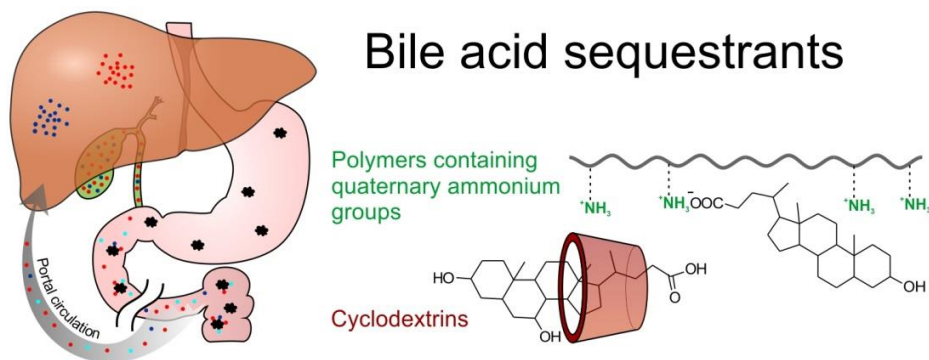
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Atherosclerotic cardiovascular disease (ASCVD), mainly consisting of coronary heart disease (myocardial infarction and coronary death), ischemic stroke and peripheral arterial disease, remains the main cause of morbidity and mortality in developing countries. Elevation of plasma total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) is a cornerstone cause of atherosclerosis, the key underlying process contributing to the most clinical ASCVD events. Among all lipoproteins, LDL is the major cholesterol-carrying lipoprotein with the most atherogenic potential. Increased LDL-C level by itself or through interaction with other cardiovascular risk factors accelerates the development of atherosclerosis. Epidemiologic, genetic, and clinical studies have demonstrated a strong exponential relationship between plasma TC, LDL-C and the risk of ASCVD [1].

Polymeric bile acid sequestrants have recently attracted much attention as lipid-lowering agents [2-4]. These non-absorbable materials specifically bind bile acids in the small intestine, preventing bile acid reabsorption into the blood through the enterohepatic circulation. Cyclodextrins (CDs) are natural compounds consisting of five or more α -1,4-D-glucose units connected in a ring, thus forming a dimensionally stable hydrophobic inner cavity and outer hydrophilic surface with localized hydroxyl groups. Related to their structure, CDs are known for their highly selective interactions with molecules having various functionalities, leading to encapsulation of the guest molecules in the cavity, forming inclusion complexes. The complexation behavior predetermines CDs to have promising BA sequestration potential [5-6]. Our research is therefore focused on development and characterization of bile acid sequestrants in the form of polymer networks containing CDs in the structure.



Acknowledgements

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8. Mono-copper substituted phosphotungstate supported on Zirconia: Synthesis, characterization and oxidation of alkenes using TBHP

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Catalyst development is no longer looked upon simply in terms of optimizing atom and energy efficiencies, but also as a clean technology. In this regard, a subclass of polyoxometalates (POMs), transition metal substituted POMs (TMSPOMs), have gained importance as they can be rationally modified on the molecular level, including shape, size, charge density, redox potentials and stability which results in their distinctive electrochemical, magnetic, medicinal and catalytic properties.

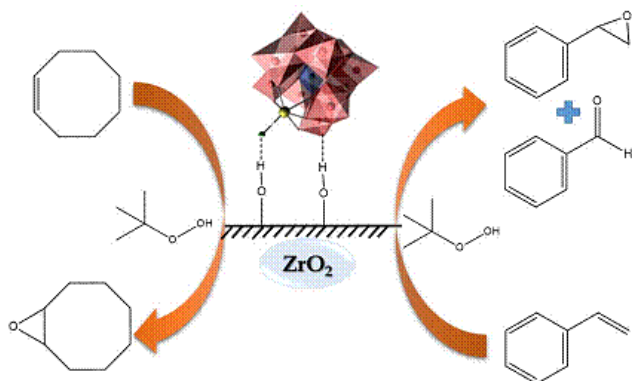


Figure 1. Schematic representation of oxidation of styrene and cis-cyclooctene using Zirconia supported mono-Cu substituted phosphotungstate.

In the present work, we report a facile synthesis of Cs salt of mono copper substituted phosphotungstate supported onto hydrous Zirconia and its characterization by various physic-chemical techniques. The synthesized material has then been evaluated for its catalytic activity for the oxidation of styrene using tert-butyl hydroperoxide as the oxidant. A detailed study was carried out to optimize the various reaction conditions like amount of catalyst, time, mole ratio of substrate to oxidant, percentage loading and temperature. The reusability of the catalyst has also been studied.

9. Osteoinductive activity of rhBMP-2 with atelopeptide type I collagen

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Bone morphogenetic proteins (BMPs) play important roles in the migration of osteoblast progenitor cells, the proliferation of mesenchymal cells, differentiation of mesenchymal cells to chondrogenic and osteogenic cells, and bone remodeling. BMPs may hold broad potential for use in the reconstruction of bone defects resulting from tumor resection or trauma and in assisting bone healing thanks to methods enabling the synthesis of recombinant human bone morphogenetic protein-2 (rhBMP-2). We previously evaluated the osteoinductive activity of rhBMP-2 combined with atelopeptide type I collagen as a carrier

in a rodent model. Although it is well known that the differentiation and proliferation activities of cells decrease with age, the relationship between aging and ectopic bone formation induced by rhBMP-2 has not been completely clarified. The aim of the present study was to investigate the effect of aging on osteoinduction by rhBMP-2.

rhBMP-2 was implanted with atelopeptide type I collagen as a carrier into the calf muscles of 3-, 8-, and 48-week-old Wistar/ST male rats (n = 12). After 21 days, the formation of ectopic neoplastic bone was examined in soft X-ray imaging, and the mineral content (BMC), bone area (BA) were measured by dual-energy X-ray absorptiometry (DXA). Their bone mineral density (BMD) was calculated as BMC per BA. In addition, hematoxylin-eosin, proliferation cell nuclear antigen (PCNA) immunostaining and von Kossa staining were performed. Data are presented as mean \pm SD.

BMD values determined by DXA were 29.40 ± 5.47 , 24.15 ± 2.33 , and 19.01 ± 2.02 mg/cm² in the 3-, 8-, and 48-week-old rats, respectively, demonstrating that BMD significantly decreased with aging (P < 0.05). The number of PCNA-positive cells also decreased significantly with aging (P < 0.01). The von Kossa stain-positive area decreased significantly with aging (P < 0.01).

The ectopic bone induction ability of rhBMP-2 decreased with aging, demonstrating the effects of aging on bone induction by rhBMP-2. These findings will be of considerable benefit in the bone regeneration of oral and maxillofacial tissue clinically in elderly patients.

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10. Antioxidant and cytotoxic capacity of dendrobium crepidatum stem extract and detection of bioactive compounds

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Dendrobium crepidatum is perennial epiphytic orchid distributed in south Asia, Nepal, China and its stems are used a folk medicine for anti-inflammatory and neurite outgrowth. In this paper, we have evaluated the antioxidant and cytotoxic capacity of crude extract of this plant and identified the bioactive compounds. Stems of *D. crepidatum* were collected from Daman of Makawanpur district of central Nepal. Five organic solvents; hexane, chloroform, acetone, ethanol and methanol were used successively in Soxhlet extraction. Antioxidant capacity of extract was determined using DPPH free-radical scavenging method and cytotoxic capacity by MTT colorometric assay. The bioactive compounds in the extracts were identified by GCMS. *D. crepidatum* ethanol (DCE) extract has shown high antioxidant capacity (IC₅₀ –73.90 μ g/ml). *D. crepidatum* methanol extract (DCM) has shown high cytotoxic capacity against HeLa cell line (IC₅₀–194.03 μ g/ml) and U251 cell line (IC₅₀–301.99 μ g/ml). The results highlight the potential of this orchid as the source for natural antioxidant and anticancer.

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11. Phytochemical analysis of selected Nepalese medicinal plants, screening for antioxidant activity and determination of total phenol and total flavonoid content

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The aim of the study was to perform phytochemical analysis of selected Nepalese medicinal plants, to screen for Antioxidant activity and determine Total phenol and Total Flavonoid content. Five medicinal plants of Nepal were selected for the study based on their traditional uses and literature review. Ethanolic extract of dried plant material was prepared by maceration. The phytochemical analysis for alkaloid, carbohydrate, glycoside, phenol, flavonoid, terpenoid, tannin and saponin was done following standard protocol. The antioxidant activity of the ethanolic extract was determined by the DPPH (2, 2-diphenyl-1-picryl-hydrazyl) radical scavenging method using ascorbic acid as the positive control. The antioxidant activity of the plant extracts and ascorbic acid was measured at different concentrations (1, 10, 100 μ g/ml) and IC₅₀ value was calculated. The total phenolic content of the ethanolic extract was determined by the Folin Ciocalteu reagent. The total flavonoid content was determined by the Aluminium chloride colorimetric method. Phytochemical analysis revealed presence of phenol and flavonoid in *Magnolia grandiflora*, Sugar free plant and *Mangifera indica*. From the study it was found that the extracts of *Tinospora smilacina*, *Magnolia grandiflora*, Sugar free plant, *Nephrolepis cordifolia* and *Mangifera indica* showed antioxidant activity with the IC₅₀ values of 41.94, 7.63, 5.91, 66.65 and 3.87 μ g/ml respectively. The standard ascorbic acid showed IC₅₀ value of 4.22 μ g/ml. The total phenol content value ranged from 43.13 \pm 1.10 mgGAE/g dry extract weight (*Nephrolepis cordifolia*) to 138.52 \pm 0.31 mgGAE/g dry extract weight (*Mangifera indica*). The total flavonoid content ranged from 25.64 \pm 7.54 mgQE/g dry extract weight (*Nephrolepis cordifolia*) to 532.76 \pm 5.70 mgQE/g dry extract weight (Sugar free plant). From the study it was found that the extracts of Sugar free plant and *Mangifera indica* showed potent antioxidant along with high phenol and flavonoid content.

12. Mg, Zn and Cu doped Li₄Ti₅O₁₂ for high power Li-ion batteries

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Li_{4-x}Mg_xTi_{5-y}Zn_y/2Cu_z/2O₁₂ has been synthesized as possible anode materials for high power lithium-ion batteries by solid state reaction. Structural changes have been investigated using XRD, IR and SEM analyses. XRD pattern revealed that spinel structure is retained upon the tri-doping of Mg, Zn and Cu into the tetrahedral and octahedral sites of Li₄Ti₅O₁₂. The SEM images show that both undoped and doped Li₄Ti₅O₁₂ have coral like shape. In IR spectra peaks at 2355 and 677 cm⁻¹ assigned to the Ti-O bond in the synthesized materials. The associated electrochemical behavior has been studied over the potential range 0 to 3 V vs Li⁺/Li.

13. Effect of sintering conditions on mechanical properties of high translucent zirconia

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It is useful to study the influence of sintering temperature and time on the mechanical properties of high translucent zirconia in detail. Zirconia discs were prepared and sintered at 1,500°C with different holding time of 10, 30, 60, and 120 minutes. The strength of the specimens was measured by the biaxial flexural strength test according to ISO-6872. There was no statistically significant difference in the strength due to the difference in holding time. Within the limitations of this study, it was concluded that a certain degree of flexural strength could be obtained even with a shorter holding time.

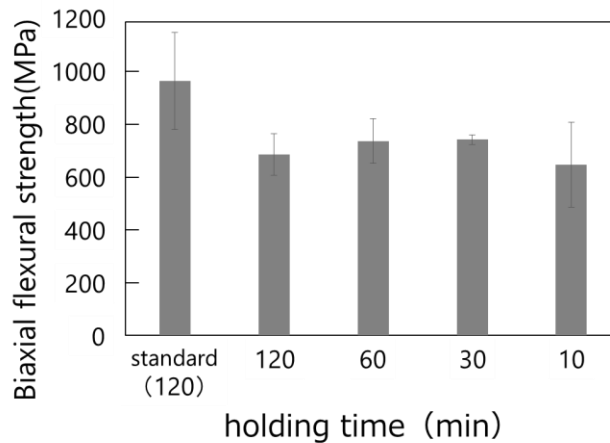


Figure 1. Effect of holding time on biaxial flexural strength.

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14. *In vitro* antibacterial screening and physico-chemical properties study of branded toilet soaps of Nepal

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The cleansing and antibacterial efficacy of five different brands of toilet soaps viz. Okhati, Lifebuoy, Lux, Liril and Neem, all contrived in Nepal, have been studied. Reference bacterial strains like *Escherichia coli*, *Staphylococcus aureus*, *Proteus vulgaris* were treated with four different concentrations of 100 μ g/ μ L, 50 μ g/ μ L, 25 μ g/ μ L, 12.5 μ g/ μ L each soap. All brands of soaps gave satisfactory results. Antibacterial activity of these soaps was different from each other. Amikacin was employed as positive control antibiotic. *Staphylococcus aureus* was very sensitive to most of the antibacterial soaps used, while *Escherichia coli* and *Proteus vulgaris* showed higher resistance to the soaps. It is obvious that antibacterial soaps have the antibacterial agents that can either kill or inhibit the bacterial cells. It might be possible that some bacterial strains become resistant which leads to their survival even at high concentrations of soaps.

Keywords: Surface tension, bacteria, conductivity, soaps

15. Synthesis of red mud based geopolymers for the replacement of OPC

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This work presents a way to valorize red mud, rice husk ash, a major waste from combustion of rice husk and white clay as a raw material for the production of geopolymers that are environmentally friendly and only requires low energy to make and have diverse potential application. A wide range of parameters in the geopolymerization reaction, consisting of RHA to RM weight ratio, variable concentration of sodium hydroxide. RHA, RM and white clay ratio and sodium silicate solutions were examined to understand their influence on the compressive strength of the end products- RHA, RM and white clay based geopolymers. The geopolymers were characterized by X-ray diffraction, FTIR. The result of compression testing indicates that the compressive strength of the studied RHA, RM and white clay based geopolymers are in the range of 2.2 to 19.5 Mpa, which is comparable with that of almost all Portland cement. In addition, the utilization of RHA, RM and white clay based geopolymers in practice is able to bring both environmental and economic advantages. The finding suggests that these wastes can be reused to make geopolymers that can find application in civil infrastructure constructions.

Keywords: RHA, RM, white clay, geopolymers, compressive strength, X-ray diffraction and FTIR

16. Biodegradable polymer from starch and PBAT using Citric acid as compatibilizer and plasticized with glycerol

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Biopolymer also called renewable polymer are usually prepared from biomass (Sugar beet, potatoes, wheat, etc.) rather than fossil-fuel. Starch, a natural polymer, nontoxic and biodegradable, that can be used for the production of bio plastics. Bio plastics are plastics that can be used like conventional plastics but will degrade by the activity of microorganism. Potato starch is used for its characteristics, which differ significantly from those of starch from other plant source (corn, sweet potatoes etc.). The objectives of this research is to extract starch from potato species cultivated in Nepal and know potency of the starch composite as an alternative of conventional plastics. For the purpose of this research, Potato species (*Kufri Sinduri*) were collected from Nepal Agricultural Research Council (NARC), Lalitpur and extraction of starch was carried out with Potassium meta-bisulfite (35g/100 l and 5g/L) and dried. Extracted sample were characterized by Fourier Transmission Infrared Spectroscopy (FTIR) and X-ray Diffraction (XRD) and compared with commercial starch. The FTIR and XRD results indicated that extraction of starch can be done from potato. A series of starch based composites with poly(butylene adipate-co-terephthalate) (PBAT) of varying concentration were prepared using citric acid as compatibilizer and glycerol as plasticizer *via* solution casting method. The properties of prepared starch were evaluated by measuring ash content, moisture content and amylose content. The resulting bioplastic were characterized for physical and chemical properties by Fourier transform infrared spectroscopy (FTIR), and X-ray Photoelectron Spectroscopy (XPS). The FTIR and XPS results of starch confirm the starch from potato. FTIR results proved the presence of interactions between starch (filler) and PBAT (matrix). Morphology of the composite was studied through X-ray photoelectron spectroscopy (XPS). Hence, starch based composite with PBAT can be easily synthesized by solution casting process with desired biodegradable properties and can be an alternative of conventional plastics.

Keywords: Biopolymer, compatibilizer, FTIR, starch, poly(butylene adipate-co-terephthalate), XPS

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17. Synthesis of TiO₂ Nano-particles by Green Method to Functionalize the Fabrics

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The lotus effect implies two indispensable characteristics into the materials: super-hydrophobic and self-cleaning. Self cleaning and self sanitizing coatings are of utmost interest in several fabrics manufacturing industries. Therefore, this work intends to design fabric materials with such properties. The coating of

hydrophobic materials such as nano-titanium dioxide (TiO₂) on the fabrics is one of the methods. Here nano-TiO₂ is synthesized by a green method with and without egg albumin. In this work, the Ti-isopropoxide is kept for oxidation followed with sonication, centrifugation, filtration and drying process [1]. Here TiO₂ produced is cross-linked with fabrics by nano-sol process and the surface gains the lotus effect. The water-repellent property can be characterized by contact angle measurement. The fabric thus produced impart good protection against UV radiation and of has antibacterial property [2].

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18. Reduced graphene oxide (RGO) integrated methyl ammonium lead halide perovskite photocell for reducing cost and improving stability

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Intense efforts have been made for improving stability and reducing the cost of the perovskite solar cell (PSCs). With the aim of devising affordable cells with modest stability of this kind in the present contribution, we report on the synthesis of Methyl ammonium leadhalide CH₃NH₃I_{1-x}Cl_x perovskite absorbing layer from low cost precursor solutions. Reduced graphene oxide (rGO) has been considered one of the promising novel materials for both as the hole transport material (HTL) and protecting layer for vulnerable perovskite layer. In this context, we prepared graphene oxide (GO) by Hummer's method and then it is reduced using sodium borohydride. Alternatively, rGO was also prepared by thermal reduction (Go was heat treated at 500 degrees for 1 hr). The resulting rGO film shows sheet resistance of 600 Ω/sq. In this conference, its application as a HTL on PSC will be discussed.

Keywords: Perovskite solar cell, graphene oxide (GO), thin film

19. Optical and thermal properties of solar thermal collectors from black nickel

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Dependence of the optical and thermal properties of the black nickel based Solar thermal collectors (STCs) deposited on copper (Cu) substrates were investigated. The devices were prepared by electro-deposition process and were heat treated at 200 °C. Each STC's performance was evaluated by measuring optical (reflectance with UV-Vis and IR Spectroscopy) and thermal properties. For later measurements,

all the STC samples were kept inside an air tight glass box and are exposed to the solar radiation. Then temperature measurement profiles over all the sunshine hours in summer (7:30 am 5 pm, Sept. 5, 2017) were monitored of each STC, simultaneously. Besides, using the best STC samples, solar water heating system (SWHS) was also devised and thermal performance was compared with the SWHS fabricated with black paint (See Fig. 1). SWHS with Ni selective coating found to show marginally better performance. Optimization of the setup is in progress and will be discussed in the conference.



Figure 1. Performance evaluation of solar water heating system fabricated using black paint (left) and black nickel selective coating.

Keywords: Solar thermal collector, Electro-deposition, Dip coating, Optical and Thermal properties

20. Phytochemical screening and evaluation of in vitro antioxidant activity of selected medicinal plants of Nepal

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The aim of this study was to perform phytochemical analysis of selected Nepalese medicinal plants and to screen them for their Antioxidant activity. Twelve medicinal plants of Nepal were collected for the study based on their traditional uses and literature review. Ethanolic and aqueous extract of dried plant materials were prepared by double maceration. The phytochemical analysis for alkaloid, carbohydrate, glycoside, phenol, flavonoid, terpenoid, tannin and saponin was completed following standard protocol. The antioxidant activity of the ethanolic and aqueous extract was determined by the DPPH (2, 2-diphenyl-1-picryl-hydrazyl) radical scavenging method using ascorbic acid as the positive control. The antioxidant activity of the plant extracts and ascorbic acid was measured at different concentrations (1, 10, 100 μ g/ml) and IC50 values were calculated. From phytochemical analysis it was found that most of the plants

contained alkaloids, terpenoids and glycosides as major constituents. From the study it was found that the ethanolic and aqueous extracts of *Viscum articulatum* Burm F. (Ethanolic IC₅₀:6.47 µg/ml; Aqueous IC₅₀:3.65 µg/ml), *Fraxinus Floribunda* (Ethanolic IC₅₀: 5.4 µg/ml; Aqueous IC₅₀:3.21 µg/ml) and *Periploca Calophylla* (Ethanolic IC₅₀:69.94 µg/ml; Aqueous IC₅₀:9.03 µg/ml) showed the comparable IC₅₀ values with that of Ascorbic acid (IC₅₀:4.06 µg/ml). From the study it was found that the ethanolic and aqueous extracts of both *Viscum articulatum* Burm F. and *Fraxinus Floribunda* showed potent antioxidant activity.

21. DFT, cytotoxicity and molecular docking studies of (E)-2((2-hydroxybenzylidene) amino-3-mercaptopropanoic acid and its Co(II), Ni(II) and Cu(II) complexes

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The cytotoxicity studies of a Schiff base; (E)-2((2-hydroxybenzylidene)amino-3-mercaptopropanoic acid (HL) derived from the condensation of 2-hydroxybenzaldehyde and L-cysteine and its Co(II), Ni(II) and Cu(II) complexes have been reported against four cancer cell lines. The evaluation of the growth inhibitory on human cancer cells is studied for the chelates against HCT-116, MCF-7, HFB-4, HepG-2 cell lines. The obtained results (**Fig. 1**) revealed that the compounds are active against human hepatocellular carcinoma cell line (HepG-2).

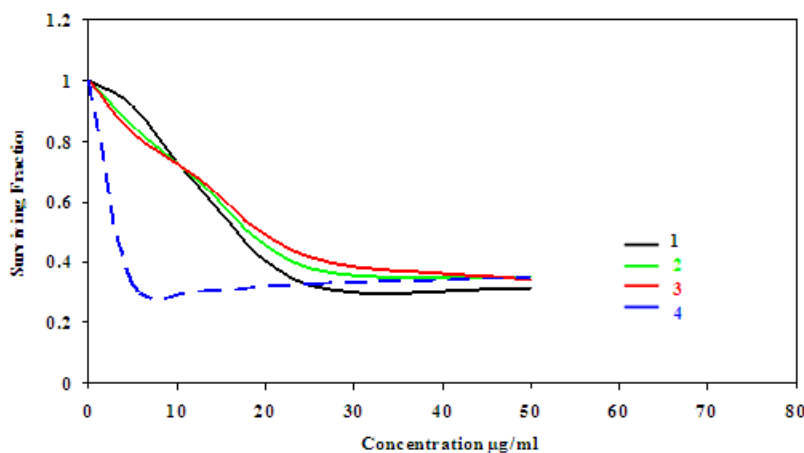


Figure 1. Surviving fraction (HepG-2) with the concentration.

The DFT calculations of the ligands and metal complexes were made to obtain bonding inside the structure by GAUSSIAN 03 rev. A.01 programme package. The QSAR study was performed by HyperChem Professional 8.0.3 software to explain the biological effectiveness of the ligands. A docking analysis using the AutoDock Vina software was carried out to understand the binding pattern of investigated compounds toward target protein kinases (1FVV and 3wze).

Keywords: DFT, cytotoxicity, molecular docking

22. Synthesis, Characterization of CuO nanoparticles and Study the Mechanical Properties of its Urea-Formaldehyde/CuO Composite

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Nanomaterials are the useful materials to develop new materials in these days. Several types of nanomaterials are employed in recent research trends. Copper oxide (CuO) is one of the promising materials in nanomaterials world which has wide field in applications. CuO nanoparticles is synthesized by chemical precipitation method using copper nitrate as the precursor and characterized by using UV-Vis spectroscopy, FTIR spectroscopy, XRD and compressive strength test. FTIR spectra no any significance functional group was involved in CuO nanoparticles. XRD measurement showed the prepared sample has the average size of 27 nm. Nanocomposite of CuO by using the urea-formaldehyde resin is prepared and its compressibility strength is measured and found that the strength of nanocomposite has increased by up to thirty five percent. Further, CuO nanoparticles has been used as nano filter to remove the Chromium ion from the waste water and is verified by the UV-Vis spectroscopy and the result showed that the concentration of the Chromium ion has reduced by forty percent.

Keywords: Nanoparticles, FTIR spectroscopy, XRD, compressive strength

23. Synthesis, size control and characterization of noble biomaterial hydroxyapatite from ostrich femur bones using calcinations at various temperatures

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Hydroxyapatite (HAp) having formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$, is the main chemical constituent of human bone tissue. It is one of the broadly studied bioceramic for non-load bearing biomedical implant and bone tissue regeneration. This study aims to extract the natural HAp from ostrich femur bone at different calcination temperatures with different particle size. The experiment starts with cleaning process of fresh ostrich femur bones. Then it is ground into particle size less than $450\mu\text{m}$ and further treated in alkaline hydrothermal hydrolysis for the removal of organic moieties. Bone powders were heated at temperature of 650°C , 850°C and 1050°C for six hours in a muffle furnace. Reverse micro emulsion techniques were used to control particle size in nano range for minimum agglomeration. Cyclohexane was used as the oil phase, mixed Tetra decyl trimethyl ammonium bromide (TTAB) and Triton X-100 as a surfactant phase. Then it was characterized by Scanning Electron Microscopy (SEM), X-ray diffraction (XRD) and Fourier transform infrared (FT-IR) spectroscopy to specify particle morphology, size, crystalline phase and chemical functional groups. Results shows, in terms of particle size, crystallite size is increasing as particle size increases but the increment crystallite size is not significant. The calcination temperature above 650°C may utilize in bone tissue engineering application.

Keywords: Hydroxyapatite, calcination, micro emulsion, characterization, XRD

24. Synthesis and characterization of Zirconium dioxide nanoparticles using Azadirachta indica leaf extract at different concentrations

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Zirconium dioxide (ZrO_2) an industrially important metal oxide with wide range of applications and also because of their intrinsic physicochemical properties such as hardness, shock resistance, wear strength, strong acid and alkali resistance etc. [1]. Among the various methods of synthesis of zirconium dioxide, green synthesis is preferable because of its eco-friendly nature and economic viability. This work focuses on the synthesis of ZrO_2 nanoparticles using Azadirachta indica leaf extract at 0.1M, 0.2M and 0.5M concentration. The extract was good reducing and capping agent and it may also effect on the size of nanoparticles due to different concentrations. By using the extract the white shiny powder was synthesized. The obtained nanoparticles were characterized by using X-ray Diffraction (XRD), FT-IR and Raman Spectroscopy. XRD analysis showed that most of the obtained nanoparticles showed mono-clinic structure along with trace amount of tetragonal structure. The crystallite size was calculated using Debye-Scherrer's equation [2]. It was found that the crystallite sizes are almost similar in all concentration of zirconium oxychloride. FT-IR spectroscopy showed the presence of -OH functional group [3] and Raman Spectroscopy showed the Zr-O bonding [4] and the crystal structures were similar to the XRD patterns.

Keywords: ZrO_2 nanoparticles, green synthesis, X-Ray Diffraction (XRD), FTIR, Raman, spectroscopy, leaf extract

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25. Synthesis and microscopic study of Zinc Sulfide nanoparticles

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The ZnS semiconductor nanoparticles were synthesized by wet chemical synthesis routes from zinc acetate [$Zn(CH_3COO)_2$] as source of zinc and sodium sulfide (Na_2S) as source of sulfur, where ascorbic acid were used as capping agents. The structural, morphological, and optical properties of synthesized nanoparticles had been characterized by X-ray diffraction (XRD), transmission electron microscope (TEM) and UV-visible spectra (UV-Vis). XRD analysis shows that samples prepared were cubic structure

and the average sizes of crystal were estimated using Debye Scherer's formula 2.3 nm and 2.1 nm at 20 °C and 45 °C, respectively. The band gaps energy and sizes of the ZnS nanoparticles were determined from the UV-Vis spectroscopy, band gap energy 3.9 eV and 4.2 eV at 20 °C and 45 °C, respectively, whereas from TEM and UV-Vis nanoparticles were conformed to be almost same sizes.

Keywords: Wet-chemical synthesis, ZnS nanoparticles, band gaps, XRD, TEM, UV-Vis

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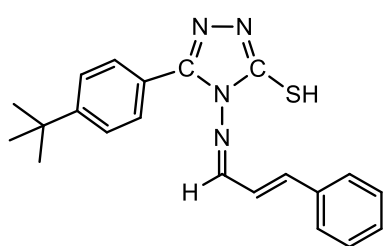
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26. Synthesis, characterization and antimicrobial evaluation of 4-amino-5-(4-tert-butylphenyl)-4H-1,2,4-triazole-3-thiol derivatives

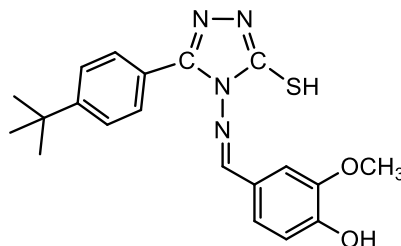
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A series of intermediates were synthesized by the reaction of 4-tert-butylbenzohydrazide with carbon disulphide and potassium hydroxide followed by cyclization using hydrazine hydrate. The structures of newly synthesized compounds (a and b) were confirmed by means of IR, ¹H-NMR and ¹³C-NMR spectral analyses. These newly synthesized compounds were also screened against bacterial strain, *S. aureus*, *E. coli* and *S. typhi* as well as the fungal strain, *C. albicans* for their antimicrobial activities. They were found to possess moderate activities against the tested microorganisms.



(a)



(b)

Keywords: 1,2,4-triazole, Schiff's base, Thiol derivatives, synthesis, antimicrobial activities.

27. Microstructural analysis of nettle fiber (*Girardia diversifolia*) as a function of processing conditions

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The fibers obtained from *Girardinia diversifolia* are commonly known as allo or “Himalayan Nettle”. In this study the fibers were treated with sodium hydroxide (NaOH) and bleaching agent sodium chlorite (NaClO₂) to obtain pure and white fiber. Thus obtained raw, alkali treated and bleached fibers were characterized by Fourier Transform Infrared (FTIR) Spectroscopy for functional groups analysis. Morphology of the fibers were analysed by high resolution optical microscope for longitudinal and cross-sectional view. Thus, images were analysed using j-image software which helped to measure dimension of the fibers. The semi-crystalline natures of the fibers were studied by X-ray diffractogram. The analysis showed diameters of the fibers 94, 69 and 60 μm for untreated; alkali treated and bleached fibers respectively. Bleached cellulose microfibrils are regularly aligned and distinctly visible as compared to the untreated fibers. Similarly, the different color observed in polarizing optical microscopic images revealed that the nettle fibers crystals are anisotropic in nature and oriented in different directions. XRD observed the crystallinity of the fibers a major diffraction peak at 2θ ranged from 22.62°, 23.15° and 23.29° for raw to bleached fiber were observed. The crystallinity index was found to be 58.02%, 60.92% and 69.53% for raw, alkali treated and bleached fibers. This study is helpful for the microstructural analysis of *G. diversifolia* nettle fibers and their properties.

Keywords: *Girardinia diversifolia*, polarized light microscopy (PLM), fibers, characterization, FTIR, cross-section

28. Synthesis and characterization of Zirconia nanoparticles using *Zingiber officinale* and investigate the microbial activity

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Nanoparticles are the most emerging materials in the recent research and development fields. The green synthesis of nanoparticle using plant extract is economical, environmentally -friendly and attractive. The current study focuses on the study of synthesis of Zirconium dioxide nanoparticles using rhizome extract of *Zingiber officinale*. The rhizome extract of *Zingiber officinale* can be used as a reducing and capping agent. The obtained nanoparticles were characterized by using X-ray Diffraction (XRD). XRD were used to study the morphological and structural properties. XRD analysis showed most of the obtained nanoparticles showed monoclinic structure. The crystallite size was calculated by using Debye-Scherrer's equation. The average size of nanoparticle was found to be 8.34 nm. Thus, characterized nanoparticle was used to investigate the antimicrobial activity. For this test Muller Hilton agar plate was used ZrO₂ nanoparticles of various concentrations were put in the solid state and the susceptibility test was done by measuring zone of inhibition. The result showed that ZrO₂ nanoparticles can be used as effective growth inhibitor in *E. coli*, making them applicable to diverge medical devices and antimicrobial control system. Hence, the green biogenic way can be used as alternative method for synthesis as it can be prepared in simple, cost effective manner, may be suitable formulation of new types of bactericidal materials.

Keywords: Green synthesis, zirconia nanoparticles, microbial activity, monoclinic structure

29. Natural dye for solar cell and hair dyeing

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This research has been carried out to employ the natural dyes in hair dyeing and dye-sensitized solar cell (DSSC). Six different aqueous extracts of natural dyes have been employed for hair dyeing with natural mordants. Due to lack of appropriate combination of natural dyes with mordants employed, natural dyes are found to dye the hair only temporarily having poor color fastness against washing. However, they have dyed fabrics (cotton and wool) with respective dyed shades. Among six dye samples, yellow dye extracted from the roots of Turmeric (*Curcuma longa*) and red dyes extracted from the bark of Majito (*Rubia cordifolia*) and Saaj (*Terminalia alata*) are found to be effective for fabrics dyeing with their respective colors.

The crystallographic structures of the ZnO and 5% Al-doped ZnO thin films developed by spray pyrolysis of zinc acetate on fluorine doped tin oxide (FTO) glass sheets have been studied by X-ray diffraction (XRD). The XRD has shown hexagonal wurtzite structure of ZnO with lattice constants $a = 3.2487 \text{ \AA}$ and $b = 5.1518 \text{ \AA}$ having particle size 25.85 nm for undoped ZnO and 33.17 nm for Al-doped ZnO indicating the increase in particle size with Al-doping. The red dye extracted from the bark of *Terminalia alata* sensitized solar cell has shown 0.31% solar conversion efficiency with ZnO photoelectrode having 2.10 mA/cm² short-circuit current density (J_{sc}), 0.73 V open-circuit voltage (V_{oc}) and 45% fill factor (FF); and 0.37% efficiency with 5% Al-doped ZnO photoelectrode having 2.25mA/cm² J_{sc} , 0.70 V V_{oc} and 52.10% FF.

Keywords: Natural dyes, dyeing, dye-sensitized solar cell, spray pyrolysis, ZnO

30. An efficient zinc oxide adsorbent for the removal of hexavalent chromium

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Zinc oxide has been successfully prepared in laboratory by simple precipitation technique. Initially 0.02 molar zinc nitrate was prepared in distilled water and then pH 7 was maintained by adding required amount of ammonium hydroxide. The precipitate was obtained which was filtered and washed several times using distilled water. Thus, obtained precipitate was dried at 70 °C in an oven. The dried material was white in color. The surface morphology and phase state were investigated by SEM (Scanning Electron Microscope) and XRD (X-ray diffractometry). SEM showed smooth flakes like surface morphology and XRD displayed a sharp peak indicating crystalline phase of ZnO. Then ZnO was used as adsorbent for the removal of hexavalent chromium. Batch experiments were performed to investigate the effects of pH of solution, adsorbent dose and contact time variations on the removal efficiency of Cr (VI). The results showed that pH 2 was optimum pH and 90-minute contact time was sufficient for maximum adsorption. Similarly, 300 mg adsorbent dose was sufficient for the 99% removal of Cr from aqueous solution.

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31. Study the effect of plasticizer, concentration of plasticizer in preparation and properties of starch based bio-film from banana peels

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Starch based biofilms are the alternative potential resource of biodegradable plastic in comparison to petroleum-based plastic for the cost as well as eco-friendly in nature. Nowadays, most of the works attracted to prepare the bio-based materials for the daily use. This study presents a biopolymer for the preparation of biodegradable films using a solution casting method with urea, glycerine, glucose, and distilled water as a plasticizer at different medium. Films were prepared at different concentration of plasticizers (1N, 5N, 15N and pure). The prepared samples were characterized by FTIR, tensile strength, acid-base resistance, soil decomposition, percentage carbon contain, water absorptivity. The result showed the lower concentration of plasticizer gives the better films than higher concentration. Among the plasticizers used urea plasticized films were better and the result showed that 1N urea plasticized films had tensile strength of 1.5 KPa. The film can resist water and base for about 4 days, but can resist acid for about 2-3 days. The result showed that films at basic medium are smooth without tears opaque in nature. Percentage carbon was compared with normal papers and polythene which showed the prepared film had greater carbon contain than polythene and lesser than paper. Similarly soil decomposition test showed the film can be decomposed completely with in 2 and half months.

Keywords: Biofilms, water absorptivity, plasticizer, tensile strength

32. Synthesis and characterization of cellulose fiber from sabai grass and their phenol-formaldehyde composites

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Cellulose is the most abundant polymer in nature composed of homopolymer of β -1,4-linked-anhydro-D-glucose units. Cellulose is used as filler material in different polymer matrices to enhance the properties of polymer matrix. Phenol-Formaldehyde resins have gained attention as important adhesives because they are inert to most chemicals, structurally stable. Different particles can be added to the adhesives to improve their properties. The objective of this study was to develop cellulose nanofiber reinforced phenol-formaldehyde (resolic) composites. Cellulose fibers were prepared from Sabai grass (*Eulaliopsis binata*) by mechanical and chemical treatments. The Sabai grass was grounded and sieved using a sieve of size 250 μ m and was bleached with hydrogen peroxide with acetic acid. The bleached sample was then treated with 6% sodium hydroxide solution to dissolve pectin and hemicelluloses. The cellulose nanofiber obtained were added to resole in the quantities 1%, 2%, 3%, 5%, and 10% by weight to prepare nanocomposites. Composites with better strength were characterized by FTIR, XRD and mechanical strength. FTIR indicated that bleaching and alkaline treatment was significantly efficient in removing non-cellulosic compounds. The diameter and crystallinity index of cellulose fiber was determined from XRD spectra and was found to be 3.8nm and 76.59% respectively. The mechanical strength of composite increased upto addition of 3% wt cellulose fiber while mechanical strength decreased on addition of 5% and 10% wt of cellulose fiber. It may be due to the agglomeration of cellulose fibers and its uneven dispersion in the composite matrix.

Keywords: Phenol-Formaldehyde composites, cellulose fibers, FTIR

33. Synthesis of eco-friendly composites of urea formaldehyde with allo and cotton fibers

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Nowadays, the need of developing sustainable or renewable plastics material is one of the most important challenges since most of the commodity plastics have been produced from petrochemical a source that causes serious environmental issues. In this research, at first the urea-formaldehyde resin (UF-resin) was synthesized in laboratory and their composites were prepared with locally available natural fibers (such as allo and cotton fibers). The different composition composites of UF-resin with allo (*Girardinia diversifolia*) fibers were prepared without using the compatibilizers by in situ polymerization followed by curing at 60 °C for 7 days. The composites were compared with cotton (*Gossypium arboreum*) fiber composites prepared with same matrix under similar conditions. This study intend to observe the morphology and structure changes of allo fibers after the chemical modification and study the effect of different fiber loading on morphology, thermal, mechanical, and water absorption behaviors of urea formaldehyde composites.

The composite materials were characterized by Fourier transform infrared (FTIR) spectroscopy, scanning electron microscopy (SEM), thermogravimetric analysis (TGA) and microindentation tests. Results shows, treated fibers to be more compatible with matrix in composites than neat fibers and effects are distinct on their morphology, thermal and water absorption behaviors. The composites are also found to be compatible, environmentally friendly and economically viable even prepared without using compatibilizers.

Keywords: Urea-formaldehyde, thermosetting polymer composites, microindentation test compatibilizers

34. Determination of some heavy metals present in different vegetables of Kavrepalanchok district

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Generally, heavy metals such as Hg, Pb, Cd refers to the metals having high density, high atomic weight and specific chemical properties. As the Heavy metals have long life, they are extremely persistent in environment and readily accumulated to the toxic levels. Due to their labile nature they are easily up taken and accumulated in different edible parts of the vegetables. Dietary intake of the heavy metals is greater concern as they directly enter into the body and passes through blood stream, get accumulated in different part of the body causing different clinical and physiological effect such as kidney damage, liver problem, cardiovascular disorder, bone disorder etc. So, it is necessary to monitor the heavy metal concentration in food stuff regularly to develop proper measure to reduce the excessive accumulation of heavy metals in food chain. So, in this study concentration of three heavy metals (Fe, Zn, Pb) in four different types of vegetables i.e. rayo, radish, tomato and potato collected from the farms of Panchkhal, Panauti and Nala was determined by using Flame Atomic Absorption Spectrometer. Result showed that the average concentration of all metals in the vegetables is in order f Fe>Zn>Pb and accumulation of heavy metals in different vegetables in order of Fruit>Leafy>Stem>Root. It is also found that all the tested heavy metals are present below the permissible limit recommended by WHO/FAO.

35. Properties of urea-formaldehyde-resin/cellulose composites

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Cellulose is the most abundant, structural, biological organic compound on Earth which is widely used in paper and textile industries. In this project work, the blend of compressive character of Urea-Formaldehyde Resin with addition of Cellulose is tested. Cellulose can be extracted from dried plant by alkaline treatment (mercerization), followed by neutralization with acid; product of which undergoes bleaching to produce pure form of cellulose. Urea Formaldehyde Resin can be prepared by heating the formaldehyde in paraffin oil bask and adding urea to it until it's completely soluble. Composite of this Urea-Formaldehyde (UF) Resin with the thus produced Cellulose fibers are prepared by simply adding the calculated amount of cellulose to UF resin and letting it to set. Characterization of pure cellulose is carried out by XRD and FTIR, whereas UF/Cellulose Composites are characterized by FTIR and compressive strength test. By the results of FTIR and compressive strength test, it is concluded that addition of Cellulose fiber to Urea-Formaldehyde Resin increases the compressive strength of the composites.

36. Preparation of conducting Nepali paper using multi walled carbon nanotubes

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The most abundant biopolymer, cellulose, was extracted from the locally available Nigalo by using standard experimental protocols. Thus prepared cellulose was changed into Micro Crystalline Cellulose (MCC) by the series of thermo chemical treatments, which was further modified into the conducting paper composite with the help of Multi Walled Carbon Nanotubes (MWCNTs) by simple paper making process. The Raw nigalo fibers, mercerized fiber (2% NaOH), bleached fibers, and cellulose-MWCNTs paper composites were studied via, Fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD) spectroscopy, Polarized optical microscopy (POM) and Conductivity tests. The FTIR study depicted the removal of the hemicelluloses, lignin and pectin. The increase in the color contrast in POM image of bleached sample indicated the increase in the crystallinity of the fiber after bleaching. The crystallinity of raw fiber increased from 56% to 63% after bleaching as indicated by the XRD plot. The bulk conductivity of the paper composite was obtained to be 1.56 S/cm (with 5% MWCNTs content) and 6.27 S/cm (for 10% MWCNTs content). Thus, it was concluded that the conductivity increases with the increment of the MWCNTs loading. However, it was not possible to study the widely varied loading of MWCNTs to determine the percolation threshold as well as, the paper composite with the functionalized MWCNTs could not be prepared.

Keywords: Composite, crystallinity, mercerization, microfibers

37. Synthesis and characterization of ZnO nanoparticles and investigate the mechanical properties urea-formaldehyde/ZnO nanocomposite

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Nanomaterials are prominently used to develop new materials and extensively studied for their optical, electronic, catalytic, antimicrobial activity etc. The Zinc oxide (ZnO) nanoparticles are semiconductor materials which are synthesized by various methods. In this work, ZnO nanoparticles were synthesized by using zinc nitrate and sodium hydroxide using starch as a stabilizing agent. The synthesis of the ZnO nanoparticles in different concentration of zinc nitrate (0.1, 0.2, 0.4M) was used in 0.1M of sodium hydroxide. The synthesized nanoparticles were characterized by the XRD, FTIR, Raman techniques and by compressive strength. By the X-Ray Diffraction (XRD), the size of ZnO nanoparticles were obtained more or less slightly different in the different concentration of source compound $Zn(NO_3)_2$. Likewise, the raman shift value were similar in all concentration of $Zn(NO_3)_2$ and the peak intensity increases with increase in concentration of $Zn(NO_3)_2$. The shift of bond strength of pure urea formaldehyde resin from that Urea-Formaldehyde/ZnO nanocomposite was observed in FTIR spectra and compressive strength value increase in concentration of ZnO increase was determined by the compressive strength tester.

Keywords: Nanoparticles, Zinc Oxide, synthesis, X-Ray diffraction

38. Synthesis and characterization of chitosan from prawn shells and study the effect of chitosan on weight loss of myrica esculenta

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Biopolymers are the alternative potential resource of biodegradable polymers in comparison to synthetic polymer for the cost as well as eco-friendly in nature. Nowadays, most of the works attracted to prepare the bio-based materials for the daily use. This study presents a biopolymer for the preparation of biodegradable polymer chitosan from prawn shells. Chitin and chitosan are considerably versatile and biomaterials. The main source of chitin is the exoskeleton of crustaceans and insects. Chitin can be converted into chitosan by deacetylation process. Chitosan is more useful and interesting bioactive polymer, biologically safe, non-toxic, biocompatible and biodegradable polysaccharide. The synthesized chitosan was characterized by molecular weight determination, degree of deacetylation, Fourier transform infrared spectroscopy, X-ray diffraction method, Nuclear magnetic resonance, X-ray photoelectron spectroscopy method. The degree of deacetylation was found to linearly increase with increase in reaction time. FTIR spectra showed the characteristic peaks of chitin and chitosan which insights into the structural features of chitin and chitosan. NMR showed the purity of chitosan. The particle size of chitin and chitosan were calculated as 3.785 nm and 2.753 nm by using Debye Scheere formula. The XPS showed characteristic binding energy of C-C, C-O-C, C-N. The effects of chitosan coating in extending postharvest life of Kaphal fruits were investigated. Change in colour, weight loss and eating quality were measured. The application of chitosan coating reduced weight loss and colour change. Furthermore, chitin and chitosan possess various natural biological activities and have a considerable potential to be utilized in anumber of industrial applications.

Keywords: Chitin, chitosan, FTIR, XRD, NMR, XPS, DD, *Myrica esculenta*

39. Physiochemical characterization of some Ayurvedic Bhasma

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Ayurveda is a traditional system of medicinal practice. Rasasatra, a branch of Ayurveda, deals with the formulation of medicine from organic and inorganic material. Bhasma are formulated based on procedure mentioned on Ayurveda. Here, some metal (Tamra, Luha, Mandura) Bhasmas and non-metal (Sankha, Pravel, Godanti) bhasmas were collected from local market, Nardevi, Kathmandu. Selection were based on typical Nepali and locally made Bhasma. In order to investigate their morphology, crystalline behavior and chemical composition, they were characterizing by using Optical microscopy, X-Ray diffraction (XRD), and Fourier transform infrared (FTIR) spectroscopy. Crystalline structures with size range of few micrometers were noted from distinct peaks on XRD spectra in all samples. However, Presence of some chemical impurity was also observed from FTIR spectrum. Texture and size were also studied from the microscopy images.

Keywords: Ayurveda, bhasma, XRD, FTIR, microscopy

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40. Influence of Fe doping into ZnO thin film for detection of ethanol vapor

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Thin films of undoped and Fe doped (1, 2, 3, 4 & 5 at %) zinc oxide were prepared on glass substrates by using a spin coating technique. Their optical and structural properties are investigated by using UV-Vis spectrophotometer and X-ray diffraction respectively. The optical band gap of ZnO was found to be decreased from 3.23 to 3.12eV for increasing doping percentage. The x-ray result shows polycrystalline nature of ZnO with preferential orientation along(100), (002) and (101) planes. The results on measurements of ZnO crystallite size (D) by using Debye Scherer's formula illustrate decrease of D from 40 nm for undoped ZnO to 15 nm 5% Fe doped. The utilization of as-prepared ZnO samples for detection of ethanol vapor has been reported in this report. The result on sensitivity measurements at 1000 ppm at different temperatures show significant decrease of operating temperature from 230°C for undoped ZnO to 190°C for 4% and 5% Fe doped ZnO. This reduction in operating temperature with increasing doping concentration may be due to change in specific surface area and increase of O- vacancies with decrease of crystallite size for increasing doping percentage into ZnO. The results also show significant decrease of response time and recovery time from 213 sec to 185sec and 322 sec to 292 respectively for increasing doping percentage.

Keywords: ZnO thin films, band gap, sensitivity, response, recovery time

41. Biowaste Reinforced Degradable Polymer Composites: A Review

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Natural fiber composites are potential alternatives for replacing non-eco-friendly synthetic materials and help to control environmental problems. Natural fibers are increasingly used as reinforcement in commercial thermoplastics due to their low cost, low density, biodegradable, readily available, high specific properties and renewable source. The composites show the comparable results for tensile strength and flexural strength tests. Performance for water absorption of composites also increases with increase in the concentration of filler loaded on matrix. Further Fourier transform infrared (FTIR) spectrum results shows the presence of different functional group like C-H, C=O, O-H and others. However the crystalline behavior and different surface fracture could be seen by X-ray spectra and SEM micrograph respectively. Due to the superior mechanical, thermal and degradable properties such polymer composites are highly demanded.

42. Photocatalytic degradation of methyl orange by bismuth vanadate nanoparticles

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Bismuth vanadate nanoparticles have been successfully synthesized in laboratory by co-precipitation technique using $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ and NH_4VO_3 ^[1]. The as-prepared BiVO_4 was characterized by XRD, SEM, FTIR, and EDS analysis. The XRD analysis showed crystalline phase of BiVO_4 which was also demonstrated by SEM image. In SEM image, agglomerated spherical nanocrystals could be obviously seen. The average particle size was found to be of 40 nm. FTIR displayed the bands of V-O-V. Similarly, EDS analysis showed homogeneous distribution of Bi, V and O. As-prepared material was applied in photocatalytic degradation of methyl orange dye. Degradation experiment has been carried out under visible light using laboratory-prepared photocatalytic reactor consisting of 1000 W Xenon lamp. The results indicated that the photocatalytic degradation rate of as-prepared BiVO_4 nanocrystals was pretty high, upto 89 percentage after 30 minutes of irradiation.

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43. Green synthesis and characterization of hematite (α -Fe₂O₃), nanoparticles and study antimicrobial activity

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Iron oxide nanoparticles are unique electronic and physiochemical properties in the fields of catalysis, environmental remediation, bio-imaging, and drug delivery, and so on. Iron oxide nanoparticles are mainly prepared by the chemical reduction of iron precursors, but the environment toxicity and expensiveness of reducing agent limits its application. Recently many people reported the leaf extract as a reducing agent for the synthesis of the variety of nanoparticles as economical, environmentally friendly, and biocompatibility source. This study investigates the simple, low cost, time-consuming, and environment friendly synthesis, characterization of ferric oxide using green tea extract as a reducing agent. The ferric oxide was characterized by X-Ray Diffraction (XRD). On the other hand, antimicrobial activity of ferric oxide was studied and for this test Muller Hilton Agar plate was used, Fe₂O₃ nanoparticles of various concentrations were supplemented in the solid state and the susceptibility test was done by measuring zone of inhibition.

The XRD pattern showed that all the prepared ferric oxide nanoparticles powder is crystalline phase. The average size of ferric oxide nanoparticles was found to be 34.54 nm. The growth of *E. Coli* was inhibited by using the ferric oxide (Fe₂O₃) nanoparticles. This result suggest that Fe₂O₃ nanoparticles can be used as effective growth inhibitors in *E. coli*, making them applicable to diverse medical devices and antimicrobial control systems.

Keywords: Antimicrobial activity, *Escherichia coli*, Ferric oxide, Nanoparticles, X-ray diffraction