Memorandum of Understanding

Between

Department of Forensic Chemistry,
Government Institute of Forensic Science,
Aurangabad 431 004,
MS, INDIA.

Department of Chemistry,
Kamla Nehru Mahavidyalaya,
Nagpur 440024,
MS India.

Memorandum of Understanding is signed with the mutual agreement of both the representatives of institutes as per:

Article 1:

The subject at present Memorandum of Understanding is the establishment of an educational cooperation between Dr. Devidas S Bhagat, Assistant Professor, Department of Forensic Chemistry, Government Institute of Forensic Science, Aurangabad 431 004, and Dr. Wasudeo B. Gurnule, Head and Research Guide, Department of Chemistry, Kamla Nehru Mahavidyalaya, Nagpur-440024, (Maharashtra) India.

Article 2:

Following terms and conditions agreed upon by both the parties to endeavor to cooperate;

1. To undertake collaborative research activities leading to research analysis.
2. To work in collaboration leading to research findings and subsequent publication.
3. To accomplish joint academic and research related activities
4. To work jointly on particular research areas for research projects, etc.
5. There will be no financial obligations/liabilities on both institutions.

Article 3:

The present MoU is intended for the next five years from **04 July 2019.**

Dr. Devidas S. Bhagat
Department of Forensic Chemistry

Dr. D. S. Bhagat
Assistant Professor, Class-I Gazetted
Government Institute of Forensic Science,
Aurangabad - 431 004.

Dr. Wasudeo B. Gurnule
Professor

Dr. W. B. GURNULE
Professor
Department of Chemistry
Kamla Nehru Mahavidyalaya
Sakkardara Square, Nagpur-24

Director
Govt. Institute of Forensic Science
Aurangabad.

TO WHOM IT MAY CONCERN

This is to certify, that there have been collaborative research activities between faculty members of ***Government Institute of Forensic Science, Nipatniranjan Nagar, Caves Road, Aurangabad-431004*** and ***Kamla Nehru Mahavidyalaya, Nagpur-440024, (Maharashtra) India***. The details of the collaborative research activities carried out are as follows:

Collaborators:

1. Prof. Wasudeo B. Gurnule, Professor, Department of Chemistry, Kamla Nehru Mahavidyalaya, Nagpur-440024, MS, India.

Between

2. Dr. Devidas S. Bhagat, Assistant Professor, Department of Forensic Chemistry, Government Institute of Forensic Science, Nipatniranjan Nagar, Caves Road, Aurangabad-431004, MS, India.

It is hence certified that there have been successful collaboration in term of research and resulted in the research paper publication during *2019-20* to *2021-22.*

No. of Publications: **15**

Dr. Devidas S. Bhagat
Assistant Professor,

Dr. D. S. Bhagat
Assistant Professor, Class-I Gazetted
Government Institute of Forensic Science,
Aurangabad - 431 004.

Prof. Wasudeo B. Gurnule
Professor

Dr. W. B. GURNULE
Professor
Department of Chemistry
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Aurangabad.

Govt. Institute of Forensic Science Aurangabad

Academic Year 2019-20

1. Bhagat, D. S., W. B. Gurnule, S. G. Pande, M. M. Kolhapure, and A. D. Belsare. "Biosynthesis of gold nanoparticles for detection of dichlorvos residue from different samples." Materials today: proceedings 29 (2020): 763-767. https://doi.org/10.1016/j.matpr.2020.04.589
2. Bhagat, D. S., P. B. Chavan, W. B. Gurnule, S. K. Shejul, and I. V. Suryawanshi. "Efficacy of synthesized azo dye for development of latent fingerprints on Non-porous and wet surfaces." Materials Today: Proceedings 29 (2020): 1223-1228. https://doi.org/10.1016/j.matpr.2020.05.480
3. Bhagat, D. S., I. V. Suryawanshi, W. B. Gurnule, S. S. Sawant, and P. B. Chavan. "Greener synthesis of CuO nanoparticles for enhanced development of latent fingerprints." Materials Today: Proceedings 36 (2020): 747-750. https://doi.org/10.1016/j.matpr.2020.05.357
4. Bhagat, D. S., S. K. Sontakke, W. B. Gurnule, and S. K. Shejul. "Ultrasonic-assisted extraction of active ingredients from Abrus precatorius seeds for study of antimicrobial activity." Alochana Chakra Journal. 9, no. 5 (2020): 717-724.

Director
Govt. Institute of Forensic Science
Aurangabad.

5. Bhagat, Devidas S., Pooja A. Chawla, Wasudeo B. Gurnule, Sampada K. Shejul, and Gurvinder S. Bumbrah. "An insight into synthesis and anticancer potential of thiazole and 4-thiazolidinone containing motifs." Current Organic Chemistry 25, no. 7 (2021): 819-841.
https://doi.org/10.2174/1385272825999210101234704

6. Bhagat, Devidas S., Gurvinder S. Bumbrah, Pooja A. Chawla, Wasudeo B. Gurnule, and Sampada K. Shejul. "Recent Advances in Synthesis and Anticancer Potential of Triazole-Containing Scaffolds." Anti-Cancer Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry-Anti-Cancer Agents) 22, no. 16 (2022): 2852-2875.
https://doi.org/10.2174/1871520622666220217161346

7. Rathod, Yashpal U., Vikram U. Pandit, Devidas S. Bhagat, and Wasudeo B. Gurnule. "Synthesis of copolymer and its composites with carbon and their photoluminescence studies." Materials Today: Proceedings 53 (2021): 123-129.
https://doi.org/10.1016/j.matpr.2021.12.422

8. Bhagat, Devidas S., Wasudeo B. Gurnule, Yashpal U. Rathod, Mahipal S. Sankhla, and Vikram U. Pandit. "Thiamine hydrochloride (vitamin B1) catalyzed greener synthesis of thiazolidin-4-one derivatives." Materials Today: Proceedings 53 (2021): 52-57.
https://doi.org/10.1016/j.matpr.2021.12.292

9. Bhagat, Devidas S., Ranjitsingh K. Nimbalkar, Sampada K. Shejul, Wasudeo B. Gurnule, Aparna B. Gunjal, and Gurvinder S. Bumbrah. "An Insight into Ayurveda and Yogic Practices Sustain Physical and Mental Health in COVID-19 Pandemic." (2021).
https://doi.org/10.33263/BRIAC104.29182932

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Aurangabad.

10.Mahant, R. D., Nitin Kongre, D. S. Bhagat, and W. B. Gurnule. "Synthesis, Characterization and Thermal Conductivity of Diglycidyl Monomer Bearing Thiourea and Salicyladehyde Group Epoxy Resin."
2021.

Govt. Institute of Forensic Science Aurangabad

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Academic Year 2021-22

11. Tiwari, Sarita, Sandhya Moghe, W. B. Gurnule, Devidas S. Bhagat, and Aparna Gunjal. "Habitat-specific microbial community associated with the biodiversity hotspot." In Microbial Diversity in Hotspots, pp. 25-43. Academic Press, 2022. https://doi.org/10.1016/B978-0-323-90148-2.00018-3

12. Bhagat, Devidas S., Gurvinder S. Bumbrah, and Wasudeo B. Gurnule. "Rare Earth Element Based Functionalized Electrocatalysts in Overall Water Splitting Reactions." In Metal Nanocomposites for Energy and Environmental Applications, pp. 205-218. Springer, Singapore, 2022. https://link.springer.com/chapter/10.1007/978-981-16-8599-6_9

13. Bhagat, Devidas S., Wasudeo B. Gurnule, Gurvinder S. Bumbrah, Pankaj Koinkar, and Pooja A. Chawla. "Recent Advances in Biomedical Applications of Biogenic Nanomaterials." Current Pharmaceutical Biotechnology (2022). https://doi.org/10.2174/1389201023666220513101628

14. Chavan, Manasi, Devidas S. Bhagat, Arpita G. Bhat, And Wasudeo B. Gurnule. "Potential Micro Organisms: An Emerging Scope Towards Composting From Solid Waste." 2022

15. Jadhav, Ekta B., D. S. Bhagat, W. B. Gurnule, S. K. Shejul, and Y. B. Taur. "Exploring the scenario of digitize pedagogy and advanced tools in higher educational teaching-learning practices."

Govt. Institute of Forensic Science Aurangabad

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Aurangabad.

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REVIEW ARTICLE

Recent Advances in Biomedical Applications of Biogenic Nanomaterials

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Abstract: The synthesis of biogenic nanoparticles from readily available natural resources may have large demand in numerous fields including pharmaceuticals and medicine. The biogenic nanoparticles catch the attention of the scientific community due to their low cytotoxicity and biocompatibility. Chemical, physical, and greener methods are used for the synthesis of biogenic nanoparticles. Researchers used eco-friendly and nontoxic approaches in the synthesis of this nanoparticle. This nanomaterial-based medicine plays a vital role in the management of public health, including earlier detection of disease, therapeutics candidates in the treatment of cancer. Biogenic nanocomposites are environmentally benign candidates that include fabrication of various composites, detoxification, and act as a catalyst in the biodegradation process. In this review article, we emphasize the recently reported methods used for synthesis, summarizing their biomedical applications and commercial and environmentally benign applications. Synthetic strategies include greener, chemical, physical, and biogenic methods and their role in surface modifiers involves various biomedical, commercial, and environmental-related applications. Moreover, we glimpse existing status, key contests, and future perspectives.

Keywords: Biogenic nanocomposite, biomedical applications, biosynthesis, ecofriendly, mechanism.

1. INTRODUCTION

Nanotechnology is advancing in all fields that benefit humans in the present decade. Nanocomposites range in size from 10 to 100 nanometers and have a large specific surface as well as radically distinct characteristics [1]. Those with a particle size of less than 10 nm are generally used in medicine, chemistry, and electronics-related fields [2]. For the last two decades, researchers have focused on the development of biogenic nanocomposite-based medicine for treatment and early detection of diseases like cancer [3]. The biogenic nanocomposites of Ag, Au, Au@Ag, Ag@Au, TiO_2 Cu, Pt, ZnO, Cu Pt, ZnO, CuO, CdS, Se, Fe_2O_3, and carbon dots have been extensively used in biomedical applications. Plant extracts are used in the development of biogenic nanocomposites, where they act as stabilising, reducing, and capping agents [4].

Due to the presence of functional molecules such as phenolic compounds, terpenoids, aldehydes, amides, and others, researchers prefer to use plant extract in the biogenic synthesis of nanoparticles, thereby overcoming issues associated with physical and chemical methods [5]. Synthesis of nanoparticles using plant extract is eco-friendly because it is biodegradable, is cost-effective, and less cytotoxic [6]. Table 1 gives an account of plant extract mediated synthesis of various nanocomposites along with their in vitro and in vivo applications [7]. In a study, scientists biosynthesized AgNPs from *Cucumis prophetarum* extract with antibacterial [8] and antiproliferative activity when tested in a cell line induced by *Aspergillus flavus* [9]. *Green synthesis of* gold nanoparticles using *Lemanea fluviatilis (L.) with significant* antioxidant activity has also been reported [10]. Biosynthesis of the copper oxide nanocomposite in the presence of Galphimia *glauca* showed remarkable cytotoxic activity [11]. Synthesis of TiO_2 nano probe using *Lippia citriodora* [12], *Justicia gendarussa* [13], *Hylotelephium telephium* [14], *Hibiscus sabdariffa* [15], *Commelina nudiflora L.* [16] and *Coleus aromaticus* [17] has also been reported. In general, silver and zinc oxide nanoparticles possess anti-inflammatory and antidiabetic activities [18].

Keeping in view the medical applications of nanocomposites, we have tried to compile the biosynthesis and biomedical applications of nanocomposites in the current paper.

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Thiamine hydrochloride (vitamin B1) catalyzed greener synthesis of thiazolidin-4-one derivatives

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ABSTRACT

Eco-friendly synthesis of thiazolidin-4-one scaffolds has been accomplished by the one-pot protocol. Thiazolidin-4-one scaffolds were obtained by multicomponent cyclo condensation of aromatic amine, a carbonyl compound, and a thioglycolic acid in thiamine hydrochloride (vitamin B1) as a biodegradable catalyst in acetonitrile solvent. The structure of the synthesized thiazolidin-4-one was elucidated by FT-IR, Proton nuclear magnetic resonance, and HR-MS spectral techniques. The reported route possesses outstanding features includes; efficient, cost-effective, easy work-up procedure, high yield, and biodegradable catalyst.

Selection and peer-review under responsibility of the scientific committee of the Polymer & Mediterranean Fiber International Conference2021.

1. Introduction:

One-pot synthesis is one of the parts of the multicomponent reactions (MCRs) which are useful in synthetic organic chemistry for designing and synthesis new heterocyclic scaffolds in chemical libraries. The MCRs are used for the synthesis of simple to complex molecules with a high degree of molecular diversity, due to the number of benefits over multistep reactions [1]. The five-membered heterocyclic compound thiazolidine (**1**) contains nitrogen and sulfur heteroatom. 1,3-thiazolidin-4-ones (**2**) possess (>C=O) carbonyl functional group. Thiazolidine is a type five-membered ring that contains a thioether group (—S—) and an amine group (—NH—) in the 1 and 3 positions. The 1,3-thiazolidin-4-ones are present in well-known drugs such as Pioglitazone (**3**) and Penicillin (**4**). Pioglitazone is an antihyperglycemic, antidiabetic drug and it decreases blood sugar for the treatment of diabetes disease. Penicillin is a broad-spectrum antibiotic that is used to control gram-positive and gram-negative bacteria [2]. The structure of these bioactive scaffolds is given in Fig. 1.

In the last three decades, the scientific community focused on the creation of bioactive heterocyclic motifs. Synthesized heterocycles have great importance in medicinal chemistry which provides the solution to numerous diseases. Nitrogen and sulfur-containing five members and six members heterocycles are building blocks of the numerous drug scaffolds [3]. Few significant thiazolidines containing heterocyclic scaffolds include; (*Z*)-3-(2-aminoethyl)-5-(4-ethoxybenzylidene)thiazolidine-2,4-dione (**5**) show greater selectivity for inhibiting the proliferation of melanoma cells bearing active ERK signaling activity [4], *N*-(5-Methyl-4-oxo-thiazolidin-3-yl)-nicotinamide (**6**) derivatives showed excellent antibacterial activity [5]. 2-imino-3-(4-arylthiazol-2-yl)-thiazolidin-4-ones (**7**) possess excellent fungicidal activity obtained from acetophenone and thiourea [6]. 2-aryl-3-(4,5,6-trimethylpyrimidin-2-yl)thiazolidin-4-one derivatives (**8**) show HIV-RT inhibitory activity [7]. 2-(4-fluorophenyl)thiazolidin-4-one (**9**) shows antioxidant activity [8]. The of the bioactive motifs are provided in Fig. 2.

The bio-heterocycles containing N, O, F, and S are among the most frequently encountered candidates in drug and pharmaceutical fields. Thiazolidinones are an important class of heterocyclic compounds that possess five-membered heterocyclic rings containing nitrogen and sulfur heteroatom. It has been considered an important building block that shows a wide range of biological activity. The derivatives of thiazolidine show pharmacological activities such as antiproliferative [9], antimicrobial [10], anti-

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Synthesis of copolymer and its composites with carbon and their photoluminescence studies

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ABSTRACT

The photoluminescence study of a copolymer and its copolymer/ carbon composite was studied using a novel comparative account. 8-hydroxyquinoline5-sulphonic acid and phthalic acid with formaldehyde were used to prepare the new composite. Various characterization techniques, such as elemental analysis, FTIR, UV–Visible, NMR (^{13}C and ^{1}H), and SEM, were used to examine the structure and characteristics of the copolymer and copolymer/carbon composite. The photoluminescence residences of lately included copolymer composites was measured on RF-501 (PC) S CE (LVD) MODEL. The factor of this present research is to supply the cooperative help amongst design and photoluminescence via new and essential commitments from dynamic specialists within the area.

Selection and peer-review under responsibility of the scientific committee of the Polymer & Mediterranean Fiber International Conference2021.

1. Introduction

As of late, there has been apparent advancement in the improvement of polymeric substances showing the capacity of iridescence. The photoluminescent materials utilized so far are being supplanted with a lot less expensive natural mixtures which do not emit harmful radiation, especially hydrocarbon subordinates of naphthalene. These mixtures with one of kind glowing properties are researched and utilized as fluorophores [1–2]. Preparation of polymer composites containing nano-sized particles of silver sulphide involves extraordinary logical and functional interest. Magerrmov et al. [3] prepared polymer nanocomposites based on polypropylene pp+ Ag_2S. It is expected that critical reduction in the intensity of the luminescence at high concentrations might be because of the phenomenon of concentration quenching and decline of the particular surface of the nanoparticles in a polymer matrix. The research centered on the phenomenon of photoluminescence present in the monomer 2,7-NAF.DM and its copolymers with different commercial monomers [4–5]. Posudievsky and colleagues concentrated on the improved and tuneable photoluminescence of polyphenylenevinylenes confined in nanocomposite films [6].

Jamaludin et al. [7] prepared photoluminescent carbon specks (CD), one of the nanomaterial family members with a size of <10 nm, have become progressively famous in the previous decade because of its remarkable optical and electric properties. Gurnule et al. [8] reports Synthesis, spectral and photoluminescence investigations of organic copolymer gum. The pre-arranged copolymer gum shows high photoluminescence properties. Dhobale and collaborators [9] orchestrated europium (Eu) doped magnesium pyrophosphate ($Mg_2P_2O_7$) nanopowders utilizing gamma light in the portion scope of 0.1 to 3 kGyby compound co-precipitation blend route. TL examination of integrated examples were performed after the illumination of $Mg_2P_2O_7$:Eu with cobalt-60 (60Co) gamma beams.

Photoluminescent supra atomic design has as of late pulled in much interest on account of their possible applications in photoelectronic gadgets or as fluorescence sensors and probes. Polymers have begun to discover use in making LEDs, liquid crystals and as sensors for metal particle fighting specialists, microorganisms and biomolecules. The photoluminescence (PL) properties of composites received with the aid of implanting green-transmitting semiconductor nanocrystals (NCs) of two distinct types (thiol-included CdTe and CdSe/ZnS) into chitosan-based biopolymer deb-

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CHAPTER

2

Habitat-specific microbial community associated with the biodiversity hotspot

Sarita Tiwari[1], *Sandhya Moghe*[1], *W.B. Gurnule*[2], *Devidas S. Bhagat*[3] *and Aparna Gunjal*[4]

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2.1 Introduction

India is ranked as a mega-diverse country enduring four biodiversity hotspots among the 36 proclaimed sites situated worldwide (De Mandal et al., 2015; Rajkhowa et al., 2015). The four regions are the Himalayas, the Indo-Burma region, Western Ghats, and the Sundaland. The arena tagged as hotspots are known for their rich and discrete biological combo witnessing biological activity par the normal limit but having fear of extinction is marked as biodiversity hotspots. The overall survey in India reports the existence of over 91,000 species of animals, and 45,500 plant species have been documented in India. The major factors responsible for creating a diverse aura are climate, temperature, soil quality, rainfall percentage, and the presence of many rivers culpable for vegetation cover and microbes dwelling in soil (Rathour et al., 2017).

The soil in the biodiversity zone is laced with a unique natural environment in which, inhabitant special microbes with distinctive characteristics also involved in plant growth, etc. have the possibility of

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Ultrasonic-assisted Extraction of Active Ingredients from *Abrus precatorius* Seeds for Study of Antimicrobial Activity

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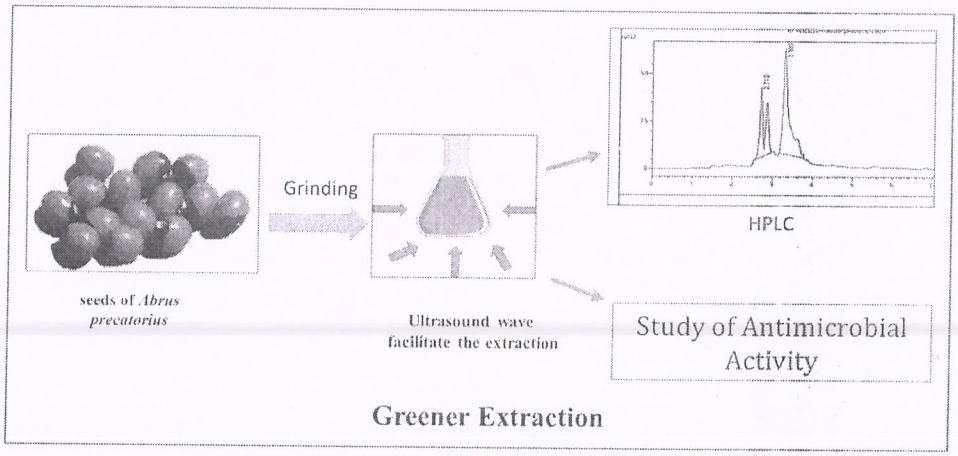
Abstract--***Abrus precatorius*** **belong Fabaceae (Leguminosae) family. It is popularly known as 'jequirity bean', 'rosary pea', liquorice, gunj (Marathi) and chirmiti (Hindi). It is herbaceous flowering plant mainly found in warm temperate to tropical regions. The seeds of this plant contain the most potent toxins known as Abrin. The LD_{50} oral dose for humans was reported in the range of 0.1-1 mg/kg. Herein, we developed the novel protocol for the extraction of active ingredients from *Abrus precatorius* seed. The extraction of active ingredient was done by ultra-sonication assisted in diethyl ether and methanol solvents at room temperature. The ultrasonic wave increases the efficiency of extraction. The crude extract of *Abrus precatorius* shows excellent anti-microbial activity against isolated bacteria from soil. The analysis seed extract was done by color test, UV-VIS, FT-IR, and HPLC.**

Graphical abstract



Keywords: Greener method, Ultra-sonication, *Abrus precatorius*, Abrin, Anti-microbial activity.

I. INTRODUCTION

Abrus precatorius climbing shrub mostly found in India. The occurrence of this plant also observed in the tropical and subtropical regions of the globe. Seeds and roots extract of this toxic herb are used in Ayurveda for treatment of alopecia and arthralgia diseases subsequently to the suitable detoxification process [1]. When the seeds of *Abrus precatorius* crushed the potent toxic ingredients will release a toxin called abrin as crushing and chewing of the seeds. Poisoning from rosary seeds is due to abrin. The mechanism of action of abrin on the human body by inhibition of protein synthesis. It inhibit protein synthesis by making of two polypeptide chains linked by a disulfide bridge [2]. In the past few decades

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Greener synthesis of CuO nanoparticles for enhanced development of latent fingerprints

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Green tea extract

ABSTRACT

Most forensic laboratories use powder and dyes to develop latent fingerprints on various surfaces. The latent fingerprint is essential physical evidence in forensic investigations. Herein, we report a novel, cost-effective and eco-friendly protocol for the synthesis of cupric oxide nano-particle using green tea extract. The CuO-Nps is a novel powder method first-time use for the development of latent fingerprints on various surfaces. The copper oxide nanoparticle having a spherical morphology and its size ranges from 500 to 900 nm. The synthesized nanoparticle powder was characterized by Fourier transform-infrared spectroscopy (FT-IR), Energy dispersive spectroscopy (EDS), and field emission-scanning electron microscopy (FE-SEM).

Selection and peer-review under responsibility of the scientific committee of the National Conference on Advanced Functional Materials 2019.

1. Introduction

Public safety and security are not only one of the most essential human needs, but also the backbone of economic stability and growth, the advancement in the field of forensic sciences leads to considerably enhanced public safety and security. In 2016, the National crime record bureau (NCRB) report averages 12,500 violent crimes committed per day in India [1]. In forensic science investigations of physical evidence, fingerprints are very significant physical evidence. Fingerprints are found in most of the crime scenes. Crime scene investigators regularly deal with developing the fingerprint on various surfaces [2]. The LPFs are get deposited on various surfaces (smooth, rough, and porous surfaces) by the friction ridges of a human finger, which has a complex mixture of natural secretions and environment contamination [3]. The natural secretions of the skin include three types of main glands (eccrine, apocrine and sebaceous) [4]. General methods are used for the development of LFPs including powder dusting, cyanoacrylate fuming and silver nitrate method. The standard powder dusting method includes metallic and non-metallic powders use for the development of latent fingerprints [5].

Now a day, the scientist community gives considerable attention to nanostructured metal oxide as a particular class of nanoparticles owing to their expected physical, biological, mechanical, catalytical, physical and chemical properties [6]. The CuO-Nps is one of the dynamic transition metal oxides which possess prominent features like high specific surface area and excellent electrochemical activity [7], excellent redox potential [8] and distinct stability in solutions [9]. The CuO-Nps shows prominent applications in the various fields like novel plastic antimicrobial agent [10], antifungal agent [11] thermochemical energy storage [12], amperometric sensors and biosensors [13], catalysts for hydrogenation reactions [14], electronic [15], antifouling coatings [16], and photodetectors [17].

In recent years, the new advancement done by the researcher community to improve the synthesis of CuO nanomaterial due to their wide range of properties and applications. Several chemical, physical and biological methods have been reported for synthesis of CuO-Nps like sol–gel method [18], chemicals reduction [19], co-precipitation [20], and microwave-assisted chemical reduction [21]. Now a day some worker's the synthesis of CuO nanoparticle using various plant extracts has been reported [22]. Few recent approaches used for the synthesis of *Aloe vera* [23], *Calotropis procera* [24], *Streptomyces* spp. [25], *Cissus arnottiana* [26], *Saccharum officinarum* [27], and *Azadirachta indica* [28].

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Biosynthesis of gold nanoparticles for detection of dichlorvos residue from different samples

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ABSTRACT

In the present study, we report the green synthesis of gold nanoparticles (Au-Nps) using chloroauric acid and leaf extract of *Citrus limonum*. This protocol was found to be efficient due to the application of greener tools like renewable aqueous solvent, plant extract bio-reduction and ultrasonication for the synthesis of Au-Nps with well-controlled morphology. This method helpful for qualitative and quantitative analysis of organophosphate insecticide, "dichlorvos" extracted from samples like soil, cloth, and viscera. The characterization of synthesized Au-Nps was done by EDS, FE-SEM, UV–VIS, TLC, and FT-IR.

Selection and Peer-review under responsibility of the scientific committee of the 11th National Conference on Solid State Chemistry and Allied Areas.

1. Introduction

Nanoparticle size of 1–100 nm, exhibit completely new or improved properties as compared to the greater particles of the bulk substantial that they are composed of, based on precise characteristics such as scattering, dimensions, and morphology [1]. Nanoparticles of coinage metal such as copper (Cu), silver (Ag), gold (Au) and platinum (Pt) are extensively useful in products that directly come in interaction with the human body like soaps, cosmetics, detergent and toothpaste, besides medical and pharmaceutical applications. Gold has extensive antiquity of use. Red colloidal gold has been used as medicine for the renaissance in China and India [2]. Au-Nps have the capacity to deliver a large number of biomolecules, without confining themselves as transporters of only minor molecules of drugs. Tunable size and functionality make them a valuable scaffold for proficient gratitude and delivery of biomolecules [3]. There are numerous ways publicized in the number of literature to synthesis Au-Nps. It consists of chemical, physical and biological approaches. The physicochemical methods are abundant in number, and many of these methods are costly or use noxious materials, hence this methodology 'not so favored' for the synthesis of nanoparticles. The feasible method to synthesize Au-Nps is employed to biological methods such as the use of plant extract [4]. The greener synthesis of Au-Npa using plant extract is interesting technique in nano-science. Various plant extracts are used for the synthesis of Au-Nps such as *Aloe vera* [5], *Azadirachta indica* (neem) [6], *Avena sativa (oat)* [7], *Mentha piperita* (peppermint) [8].

In the past few decades, the researcher community focused on the capability of biological molecules used to reduce metal forerunners, but the mechanisms are still unknown. The progress of efficient green synthesis employing various plant extract acts as stabilizing, capping and reducing agents which is illustrated in Table 1). The Scientist community concentrates on minimizing use of toxic reagents and high energy consumption routs used for the synthesis of nanoparticles by using alternative greener methods like biological methods [9–11]. The advancement in experimental techniques for the synthesis of Au-Nps includes sizes and particles containing uniform morphology needed for its develop. As far as the synthesis of Au-Nps is concerned, wide number of methods are there in the literature, such as use of *Euphorbia condylocarpa M. bieb* as reductant and stabilizer for synthesis of Au-Nps [12], microwave-assisted synthesis of graphene-based Au-TiO_2, silver nanoparticles using poly-*N*-isopropylacrylamide [13], ionic liquid mediated synthesis of fluorescent carbon nanoribbons, nanoparticles and graphene [14], novel thiol-functionalized ionic liquids mediated synthesis of gold and platinum nanoparti-

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REVIEW ARTICLE

An Insight into Synthesis and Anticancer Potential of Thiazole and 4-thiazolidinone Containing Motifs

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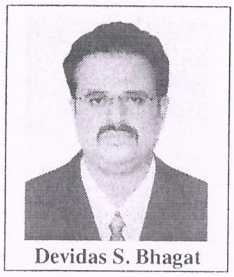

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Abstract: Over the years, the branch of oncology has reached a mature stage, and substantial development and advancement have been achieved in this dimension of medical science. The synthesis and isolation of numerous novel anticancer agents of natural and synthetic origins have been reported. Thiazole and 4-thiazolidinone containing heterocyclic compounds, having a broad spectrum of pharmaceutical activities, represent a significant class of medicinal chemistry. Thiazole and 4-thiazolidinone are five-membered unique heterocyclic motifs containing S and N atoms as an essential core scaffold and have commendable medicinal significance. Thiazoles and 4-thiazolidinones containing heterocyclic compounds are used as building blocks for the next generation of pharmaceuticals. Thiazole precursors have been frequently used due to their capabilities to bind to numerous cancer-specific protein targets. Suitably, thiazole motifs have a biological suit *via* inhibition of different signaling pathways involved in cancer causes. The scientific community has always tried to synthesize novel thiazole-based heterocycles by carrying out different replacements of functional groups or skeleton around thiazole moiety. Herein, we report the current trend of research and development in anticancer activities of thiazoles and 4-thiazolidinones containing scaffolds. In the current study, we have also highlighted some other significant biological properties of thiazole, novel protocols of synthesis for the synthesis of the new candidates, along with a significant broad spectrum of the anticancer activities of thiazole containing scaffolds. This study facilitates the development of novel thiazole and 4-thiazolidinone containing candidates with potent, efficient anticancer activity and less cytotoxic property.

Keywords: Heterocycle, thiazole, 4-thiazolidinone, synthesis, isolation, anti-cancer activity, oncology.

1. INTRODUCTION

Cancer disease exerts an enormous burden on the shoulder of the scientific community, pharmaceutical industries and governments throughout the world. It is caused due to the unrestrained, quick and pathological proliferation of abnormal growth of the cells, and it is one of the key issues of most difficult suffering in the Globe [1]. Daily hurdles of new drug discovery for the treatment of various types of cancer have demanded the development of new therapeutic agents and an efficient strategy for the replacement of old drugs with new ones [2]. In cancer therapy, the average time required for the development of a new drug molecule is around 13 years of research. In addition to this, few more years are also required for the design and production, evaluation of efficacy, toxicity, pharmacokinetic and pharmacodynamic profiles of the developed drug. Initially, this kind of study is mainly conducted on animal tissue, and if good results are produced, then it proceeds for human trial [3]. Four-decade before US National Cancer Institute firstly developed 60 human tumor cell lines for developed anticancer medicine by *in vitro* drug-discovery [4]. Cancer cure therapy includes radiation-therapy, chemotherapy, surgical intervention, targeted-therapy and other treatments [5].

A wide range of heterocyclic drugs showing anti-cancer activity is reported in the literature. Often the heteroatom that exists in the drug's moiety imparts a specific biological response. Amongst the heterocycle galaxy, the thiazole containing heterocycle has a broad spectrum of biological significance like antiviral, anti-inflammatory, antibacterial, and antifungal activities [6]. Annually, millions of individuals may die or suffer from cancer due to the lack of availability of an effective, inexpensive anti-cancer drug. Therefore, it becomes a global health issue, and there is no appropriate medicine for the treatment of this disease [7]. The globally estimated responsible death ratio due to cancer is 1:8 deaths. The people who face such kind of problems are also facing the economic crises related problem during its treatment [8]. In the arena of oncology, research scientist has a great challenge with social responsibility to discover novel and effective scaffolds with broad-spectrum anticancer properties [9]. Research in the discovery of anticancer drugs has great curiosity, and, therefore, the research community is actively

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Efficacy of synthesized azo dye for development of latent fingerprints on Non-porous and wet surfaces

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ABSTRACT

Latent fingerprints (LFPs) play a key role in illegitimate investigations in most of the crime. Mostly, physical evidence is used to establish a relationship between crime scenes and criminal in the justice procedure. We developed a novel protocol for enhanced development of LFPs on non-porous and wet surfaces by physical powder dusting method. The azo-dye was obtained from β-naphthol and aniline by the diazo-coupling reaction. The wet finger-print gives excellent results up 10 days and developed LFPs were visualized on 11 different surfaces. In the present work we report; a simple, rapid, less toxic, efficient, cost-effective alternative method for the development of LFPs by powder method. Characterization of azo dye was done by HR-MS, FT-IR, UV–VIS and TLC.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Advanced Functional Materials (Innovations in Chemical, Physical and Biological Sciences).

1. Introduction

Forensic investigators are regularly encountered with the latent fingerprints (LFPs) development and detection tasks. The human fingerprints have characterized the pattern of raised papillary ridges and depressed furrows. The formation of fingerprints on different non-porous surfaces like paper, plastic, glass, wooden and metal articles due to physical touch. When the hands are touches to various surfaces subsequently the oily substances and sweat present on the fingertip of the skin may shift and deposited on respective the surface [1]. The features of human fingers have three types of fingerprints nature. The first types of feature deals with pattern include arch, loop, or whorl, core and delta. The second type of feature indicates the natures of ridges like ridge endings, bifurcations, dots. The third type of feature deals with the details of minute each friction ridge such as edge shapes, and sizes. These characteristic patterns are unique every human being and remain persists throughout life span [2,3]. In a few crime scene cases, the impression of the suspected fingerprints maybe gets contaminated by environmental, social and personal factors like air, dust, blood, water and paint. In most of the criminal cases, the fingerprints left at crime scenes side was not immediately identified and visualized by naked eyes. It needs to be developed LFPs by proper techniques for visualization and analysis [4]. The LFPs have probability with the contamination chances with drugs metabolite, explosives residues, and other chemicals [5]. The chemical composition latent fingerprints residue have a mixture of amino acids water, salts and fatty acids, exclusively the developing agent selectively attacks the amino acids and fatty residues to provides a nice contrast between the surface and fingerprint ridges [6].

In the recent few decades, common methods are used for the visualization of LFPs in various non-porous surfaces includes powder dusting, cyanoacrylate fuming, iodine fuming, ninhydrin dipping, and silver nitrate soaking [7]. Forensic experts most frequently used the powder dusting method in crime scene investigation due to the wide range of high applicable efficiency [8]. The colored or fluorescent powders are mostly used for the development of LFPs become a burning topic in today's era [9]. Besides, the powder dusting method has features like low toxicity, time-saving, cheap and highly sensitive [10]. Nevertheless, these traditional protocols used for the development and detection of LFPs not always effective. Hence, the researcher community focused on the improvement of existing methods used for clear and effective visualization of LFPs [11].

The number of advanced dyes is used in the powder dusting method to validate for the development of LFPs on various non-porous surfaces has been demonstrated. There are few commer-

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An Insight into Ayurveda and Yogic Practices Sustain Physical and Mental Health in COVID-19 Pandemic

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Abstract: The worldwide public health disaster caused due to a viral outbreak of the coronavirus disease 2019 (COVID-19 or SARS-CoV-2) challenges the entire healthcare system. The COVID-19 is a highly pathogenic viral transmittable infection that causes the severe acute respiratory syndrome. It is a kind of pneumonia virus and the third type of coronavirus after severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS). In December 2019, the third coronavirus was discovered in patients with infectious respiratory disease in the capital city Wuhan, Hubei province, and initiate a global pandemic. It has a very high human-to-human transmission ability, which results in spread rapidly all over the world. Today's necessary to understand the physiopathology of COVID-19, which causes a global pandemic and infects more than 136 million people. The COVID-19 genome sequence is similar to the other two coronaviruses, with about 80% sequence identical with SARS-CoV and about 50 % with MERS-CoV. Remarkably, COVID-19 has a 90% similar whole-genome sequence with bat coronaviruses. The worldwide mortality rate of COVID-19 is 1 to 2%. Ayurvedic remedies; yogic practices like yogasanas, breathing pranayama, and meditation; other traditional Indian practices include decoction and drinking of herbal remedies. The Ayurveda, Yogic science, and other ancient practices boost the immune system, improve lung function, improve physiological strengths, normalize cognitive functions, and reduce the pandemic's community speeding. Ayurvedic remedies and yogic practices help to cope up with the COVID-19 pandemic. Yoga and ayurvedic were elements of daily routine practices of peoples in ancient times to keep themselves healthy.

Keywords: COVID-19; Ayurveda; Yogic practices; pandemic; health; ancient Indian practices.

1. Introduction

In December 2019, the global pandemic outbreak of SARS-CoV-2 in Wuhan, the capital city of Hubei province, spread dramatically into Wuhan city, with an ongoing risk of a global pandemic [1]. On 30th January 2020, the World Health Organization (WHO) declared

SCIENG PUBLICATIONS

Chapter 1

POTENTIAL MICRO ORGANISMS: AN EMERGING SCOPE TOWARDS COMPOSTING FROM SOLID WASTE

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ABSTRACT

Chemically produced fertilizers make nutrient availability easy for plants, but their disadvantages outweigh their advantages. For instance, they contribute to environmental pollution, greenhouse effects, death of soil organisms and depletion of the ozone layer, marine inhabitants, and human diseases. Composting is sustainable technology, though it has some imperfections that have reduced its extensive usage due to which use of chemical fertilizers has been publicized. The use of composting is a natural process in agriculture and helps in the recycling of farm wastes. In these conditions, microorganism plays a promising role. The potential microorganisms can be used effectively for reawakening the environment. The microorganism can act as magic bullets for bioremediation of contaminated sites and biodegradation purposes. This chapter gives an insight into different types of wastes its proper management through composting, different composting methods and explains how microorganisms can be used effectively for waste management (WM) and sustaining our environment in a greener way.

KEYWORDS: Municipal solid waste, Effective microbes, Composting, solid waste management.

INTRODUCTION

India is a developing country with an increasing population rate and simultaneously expanding the rate of waste generation per day. Approximately 1, 88, 500 tons of municipal solid waste is generated per day in urban India (Chaturvedi and Kaushal 2018). Solid waste management in India is applied by landfilling, dumping, and composting. Generally Municipal solid waste consists of household and industrial wastes like organic decomposable matter such as paper food waste agricultural waste partially decomposable

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Exploring the scenario of digitize pedagogy and advanced tools in higher educational teaching-learning practices

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Abstract: In the current era, technology-based education is omnipresent in the world, especially in the COVID-19 pandemic. Development in innovative teaching-learning pedagogy includes attentions to numerous tools, techniques, software, mode, content, and other educational resources use in higher educational teaching-learning practices. The design of innovative pedagogy help to improve the quality of learning facilitated psychological theories includes behaviorism, cognitivism, and situated learning. The digitalize pedagogy and advanced tools include video conferencing applications, e-resources, MOOCs, advanced classroom tools. Finally, digitized pedagogical approaches in higher education teaching-learning practices, the role of new educational pedagogy, and advanced tools play a remarkable role in the education system.

Keywords: Online teaching learning, E-content, advanced tools, Innovative pedagogy, Video conferencing

I. INTRODUCTION

Coronavirus pandemic collapsed the whole educational system in lockdown period and challenge entire educational researcher and system of the globe. The digitized technology and advanced tools facilitated online teaching-learning in the whole world (Mishra et al., 2020). Approximately three billion children and adolescents are not in school, college, university, institution due to the SARS-CoV-2 pandemic (Bates et al., 2020). Digitize pedagogy and advanced tools in higher educational teaching-learning practices influential Bloom's Taxonomy to achieve educational goals (Arievitch, 2020). This technology based education measured student outcomes and help to describe their goals by developing their thinking skills assessed into six categories (Stanny, 2016). The current educational system includes modern techniques which often use to educate students and make them to clear, skilled enhanced, and understandable. Now a day use of internet-based technology and tools too more useful to educate the student in simple ways (Crook & Nixon, 2021). The modern tools and technology are more adequate for students and teachers due to their more open, flexible learning technologies and ease of access and utility. The advanced innovative tools and techniques enhance the whole education system, which plays a significant role in development and nation-building (Zachos et al., 2018).

Over the past two decades, there has been a sustained and continuous development in teaching-learning practices. The affordable online teaching-learning provides a forum to teachers, and students by engaging themselves in authentic, fruitful knowledgeable, and healthy interaction (Lock & Redmond, 2021). Video Conferencing Platforms are turn out to be part of routine teaching-learning practice includes google meet, Microsoft teams, zoom meet, WebEx teams, and GoToMeeting, etc. This video conferencing software plays a remarkable role in the online teaching-learning practice in the COVID-19 pandemic (Carrillo & Flores, 2020). E-content is the backbone of digitalize teaching-learning practices such as e-book, e-library, mobile applications, etc. E-content development is a revolutionary step in educational research (Ajegbomogun et al., 2017). MOOCs (massive open online courses) are modern e-learning resourcefulness for widespread in the whole world. These courses are skilled enhanced and free of charge which removed the barrier and boundaries that came across traditional teaching-learning practices (Hew & Cheung, 2014). All aspects of digitize pedagogy and advanced tools in higher educational are illustrated in figure no. 1.

Synthesis, Characterization and Thermal Conductivity of Diglycidyl Monomer Bearing Thiourea and Salicyladehyde Group Epoxy Resin

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***Abstract*-- Noveldiglycidyl monomers bearing phenylthiourea and azomethinegroupswerepreparedusing4,4[1]-diaminodiphenyl etherand4,4[1]-diaminodiphenyl sulphone as reactants. The monomers were characterized byFTIR and ^{1}H-NMR spectroscopic methods.**

The monomers were blended with epoxy based trickle impregnation resinandcured.Thecuredresinsweresubjectedtothermaogravimetricanalysis and Differential scanning colorimetry analysisinpresence of 3% by weight of the diglycidyl monomers bearing thiourea and azomethine groups in the cured blends did not alter the thermal stability but increased the thermal conductivity. The thermal conductivity of the cured blends was approximately 2.1 times higher than that of epoxy-based trickle impregnation resin.

***Keywords*--**Diglycidyl monomers; Phenylthiourea; Thermal conductivity, Spectral analysis, TEM.

I. INTRODUCTION

Epoxy resins are low molecular weight pre-polymers or higher molecular weight polymers which normally contain at least two epoxide groups. The epoxide group is also sometimes referred to as a glycidyl or oxirane group. Epoxy resins are polymeric or semi-polymeric materials, and as such rarely exist as pure substances, since variable chain length results from the polymerisation reaction used to produce them. High purity grades can be produced for certain applications, e.g. using a distillation purification process. One downside of high purity liquid grades is their tendency to form crystalline solids due to their highly regular structure, which require melting to enable processing. Epoxy resins are fundamentallyprepolymers that have on an average two or more epoxide groups per molecule[1].Formulations of epoxy resin play significant role in the electronics industry and are employed in transformers, transistors, generators, integrated circuits,andmotors. These resins are very good electrical insulators and protect electrical com- ponents from moisture,dust and short circuiting. Both elec- trical and electronic equipment have newly been improved in size and performance with designs to diffuse the heat from internal components efficiently.

Electronic and electrical equipment should be insulatedwithmaterialsthathavehigher thermalconductivities usually thermoset composites containinginorganic ceramic powders having elevated thermal conductivity are used. Silicon Carbide, Aluminum oxide and magnesium oxide particles are some of the inorganic fillers used for the development of thermal conductivity of

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Contributions and Current Trends of Forensic Botany in Crime Scene Investigation

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Abstract

Forensic botany is the field of science that applies the knowledge, techniques, and study of plant science to legal matters. The term forensic botany proves that plants can provide forensic evidence, as various plant species occur in the environment, which is limited to specific geographic locations. Besides, every species has unique characteristics. Hence, these features make plants be useful evidence for solving criminal and civil cases. However, forensic botany remains an underutilized field in forensic casework. Furthermore, although most forensic scientists are familiar with methods for human identity testing, the use of the plant, animal, and insect evidence is yet unknown. This low knowledge is due to a lack of awareness by evidence collection teams, who do not necessarily know the importance of collecting botanical trace evidence. Therefore, this review article encompasses different sub-disciplines that come under forensic botany along with case reports and proper collection procedures of botanical evidence. Overall, this article gives the importance and applications of botanical evidence during criminal and civil case investigations.

***Keywords:** forensic botany, botanical evidence, crime scene investigation*

Introduction

The law of circumstances states that "Facts do not lie, but man can do." This law proves that every piece of evidence is important and useful while investigating a sequence of events. It also indicates that oral testimony can be influenced or changed, but the result of physical evidence along with other corroborative evidence cannot be changed, which makes a sequence of the event clear. Therefore, it is necessary to carefully collect every piece of evidence and preserve it properly. Similarly, the omnipresence of botanical evidence on the crime scene enhances its usefulness in solving criminal cases. Therefore, forensic botany is the field of science that

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Research Article

Environmental, Thermal, and Mechanical Studies of SBR-Nano Aluminum Oxide Composites

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Abstract

Objective: The present study looked at the abrasion characteristics of two-part matrix nanocomposites made of styrene butadiene rubber (SBR) and nano aluminium oxide. The wear characteristics of various forms of polymeric matrix have been sporadically studied. In the present investigation, our main aim was to synthesize rubber/nano aluminium oxide nanocomposites as possible materials in industrial applications and to evaluate environmental, thermal and mechanical properties of the composite.

Methods: The formulations of the styrene-butadiene rubber compounds were reinforced with aluminum oxide nanoparticles. Mixing was performed at room temperature using two-roll mixing mill with a rotor friction ratio of 1:1.25. After the coagulation of rubber composites, rubber matrix was washed with water and dried at 70°C. SBR-nanocomposite was synthesized by emulsion polymerization method.

Results: Elemental analysis results were in good agreement with the calculated values. The increased crosslink density, which resulted in increased hardness and modulus ultimately, produced the enhancement of abrasion resistance. The abrasion resistance is an essential property for the application of tire and belt. The properties were enhanced because of the higher polymer filler interactions than filler-filler interactions. The functional groups were incorporated into the polymer, and the stress is much more efficiently transferred from the polymer matrix to the inorganic filler, resulting in an increase in tensile properties. The enhanced degree of filler-polymer interaction is known for its ability to restrict the swelling ratio. The order of activation energies for SBR-nano aluminum oxide nanocomposites was parallel to the order of their thermal stability. The order of reaction (n) of SBR-nano aluminum oxide composite was 0.40.

Conclusion: All the nanocomposites are potential candidates to prepare SBR rubber hybrid composites.