

# 11<sup>th</sup> National Conference on Condensed Matter Physics and Applications

*Cmpa* 2023

**ABSTRACTS**



**Date: 14-15 Dec 2023**

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## PyP<sub>4</sub>OH<sub>8</sub> additive Ni MOF electrode for non-invasive glucose detection using extended gate field effect transistors for diagnosing diabetes mellitus.

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**Abstract:** The aim of this study is to detect glucose in a non-invasive and nonenzymatic manner by utilizing an extended gate field effect transistor (EGFET) based on the organic molecule PyP<sub>4</sub>OH<sub>8</sub> additive nickel Metal-organic framework (MOF). The prepared electrode responds selectively to glucose instead of sucrose, fructose, ascorbic acid, and uric acid in 1X Phosphate Buffer Saline (PBS) solution. Also, utilizing a scanning Kelvin probe (SKP) system, the sensing electrode's work function ( $\Phi$ ) was measured to understand the glucose-sensing mechanism. The sensitivity, detection range, and limit of detection (LOD) of the electrode were determined to be 24.5  $\mu\text{A mM}^{-1} \text{cm}^{-2}$  20  $\mu\text{M}$  to 10 mM and 2.492  $\mu\text{M}$ . The sensor operates at a voltage of 0.8 V with a response time of less than 5s. The real-time analysis revealed that the prepared electrode is sensitive to detect glucose in real human saliva, and it can be the alternative device for the noninvasive detection of glucose. Overall, the outcomes of the EGFET and SKP studies demonstrate that the prepared electrodes are well-suited for expeditious detection of glucose levels in saliva.

**Keywords:** Salivary glucose, Diabetes mellitus, EGFET, Scanning Kelvin probe (SKP), Phosphate buffer saline (PBS), nickel MOF on carbon paper

### References

(1) Kuppuswamy, G. P.; Swamy, M.; Matada, S.; Marappan, G.; Mulla, M. Y.; Jayaraman, S. V.; Natale, C. Di; Sivalingam, Y. NiOX Template-Grown Ni-MOF-Coated Carbon Paper Electrode Embedded Extended Gate Field Effect Transistor for Glucose Detection in Saliva : En Route toward the Noninvasive Diagnosis of Diabetes Mellitus. **2023**.

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(2) Kuppuswamy, G. P.; Pushparaj, K.; Surya, J. PAPER A ZIF-67 Derived Co<sub>3</sub>O<sub>4</sub> Dodecahedron Shaped Microparticle Electrode Based Extended Gate Field-Effect Transistor for Non-Enzymatic Glucose. **2022**, *1*, 5345–5355. <https://doi.org/10.1039/D1TC05281K>.

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## Aluminium Nitrate doped Methyl Cellulose based solid polymer electrolyte films: Properties and Applications

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**Abstract:** This study presents the preparation of a solid polymer electrolyte film using a biopolymer Methyl cellulose doped with Aluminium Nitrate via the solution casting method. The application focus is on energy storage. Various techniques were employed to analyze the properties and attributes of the polymer electrolyte. The polymer electrolyte's structural and morphological characteristics were investigated through XRD, FTIR, and scanning electron microscopy. UV-Visible spectroscopy quantified the light absorption capacity of the electrolyte film. The investigation involved studying the current-voltage relationship of different compositions of polymer electrolyte based on methyl cellulose. Furthermore, the electrochemical stability window was computed. Notably, the value of the electrochemical stability window varied across multiple samples due to changing salt concentrations. Among these, the highest stability window was observed in the MA30 sample, which consisted of an electrolyte film containing 30 wt.% of salt. The study also assessed the I-t (current-time) behavior of diverse electrolyte films. The ionic conductivity of each film exhibited variability based on the concentration of salts within it. The most remarkable finding was the ion transference number, reaching 0.999 for the MA30 sample, emphasizing its superior performance among the various electrolyte films considered.

**Keywords:** Methyl cellulose; Aluminium nitrate; Solution casting technique; Solid polymer electrolyte; Energy storage applications

P-03

## Structural and Optical properties of Al<sub>2</sub>O<sub>3</sub> doped Bipolymer (PVA/CMC) nanocomposites.

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**Abstract:** In the present study, Structural and Optical properties of (PVA/CMC/Al<sub>2</sub>O<sub>3</sub>) polymer nanocomposites. Nanocomposites made with different concentrations of (0, 2, 4, and 6%) Al<sub>2</sub>O<sub>3</sub> doped to polyvinyl alcohol and carboxyl methyl cellulose (70%/30%) by solution casting method. It has been observed that structural properties changes after gamma irradiation were confirmed by X-ray diffraction studies. UV result showed absorption coefficient, refractive index increased and optical band gap decreased with increased the concentration of Al<sub>2</sub>O<sub>3</sub> of before and after Gamma irradiation. The optical properties of nanocomposites films make them promising materials for flexible optoelectronics devices applications.

**Keywords:** CMC: Optical Band gap: Gamma Irradiation

### Reference:

1. Al-Muntaser, A. A.; Pashameah, R. A.; Sharma, K.; Alzahrani, E.; Hameed, S. T.; & Morsi, M. A. Boosting of structural, optical, and dielectric properties of PVA/CMC polymer blend using SrTiO<sub>3</sub> perovskite nanoparticles for advanced optoelectronic applications. *Optical Materials*. (2022), 132, 112799.
2. Rasheed, H. S.; Abbas, I. A.; Kadhum, A. J.; & Maged, H. C. The effect of gamma irradiation on the optical properties of (PVA-PAA-Al<sub>2</sub>O<sub>3</sub>) films. In *AIP Conference Proceedings* (Vol. 2190, No. 1). AIP Publishing. (2019, December).
3. Atta, M. R.; Alsulami, Q. A.; Asnag, G. M.; & Rajeh, A. Enhanced optical, morphological, dielectric, and conductivity properties of gold nanoparticles doped with PVA/CMC blend as an application in organoelectronic devices. *Journal of Materials Science: Materials in Electronics*. (2021), 32, 10443-10457.

P-04

## Magnetic and Non-linear optical properties of gel grown Strontium Magnesium Oxalate crystals

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**Abstract:** Single crystals of Strontium Magnesium Oxalate (SrMgO) crystals were grown by silica gel method in the ambient temperature. Grown crystals show good magnetic and non-linear optical properties. The gram susceptibility ( $\chi_g$ ), molar susceptibility ( $\chi_m$ ), magnetic moment ( $\mu_{\text{eff}}$ ) of SrMgO crystals are calculated by Gouy balance. Grown crystals are diamagnetic in nature. Crystals are characterized by FT-NMR spectroscopy it reveals the chemical shift and identifies presence of functional groups in the grown crystals. Nonlinearity of SrMgO crystals confirmed by parameters like Nonlinear absorption co-efficient ( $\beta=10^{-4}$  cm/W), non-linear refractive index ( $\eta=10^{-9}$  cm<sup>2</sup>/W), third order real part of non-linear susceptibility ( $\chi_r=10^{-7}$  esu), third order imaginary part of non-linear susceptibility ( $\chi_{\text{im}}=10^{-9}$  esu) and molecular hyperpolarizability ( $h_r=10^{-27}$  esu) are recorded by Z-Scan technique.

**Keywords:** Silica gel, Gouy balance, FT-NMR, Z-scan, Nonlinearity

### Reference:

1. K.Sivakumar, M.Senthilkumar, Ramachandra Raja., Rasayan J. Chem, 11(2), 676-681(2018)
2. J.Rajeev Gandhi, M.Rathnakumari., Optik, 125, 6462-6465 (2014)
3. T.Thilak, M.Basheer Ahamed, G.Vinitha., Optik, 1224, 4716-4720 (2013)
4. P. S. Patil, N. B. Gummagol, A. Ekbote., J. Molecular Structure, 1219, 1-17 (2020)
5. V. S. Naik, P. S. Patil, Qin Ai Wong., J. Molecular Structure., 1222 (128901), 1-17 (2020)

P-05

## **Influence of precursor molarity on physical properties of zinc oxide (ZnO) nanoparticles synthesized using Psidium Guajava (guava) leaf extract**

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**Abstract:** The biosynthesis of metal oxide nanoparticles especially using botanical extracts has become an evolving field in nanotechnology. The present study demonstrates an eco-friendly synthesis of ZnO nanoparticles using leaf extract of Psidium Guajava commonly known as Guava. The effect of precursor molarity on the structure, size, optical properties, and chemical composition of ZnO nanoparticles has been studied. Here we used zinc acetate as a precursor and sodium hydroxide as a reducing agent. By changing the molarity of the precursor we repeated the experiment and studied how it affect the physical properties of produced nanoparticles. Particles were characterized by Scanning Electron Microscopy- Energy Dispersive X-ray spectroscopy (SEM-EDAX), Ultra-violet Visible spectroscopy (UV-Vis), and X-ray Diffraction (XRD) analysis. All the characterization techniques used in this study revealed the crystallinity, size, optical properties, and composition of ZnO nanoparticles. Average particle size as measured from the X-ray pattern using the Debye-Scherrer formula was found to be in the range of 30-40 nm for precursor molarity 0.4M, 0.5M, 0.6M, and 0.7M respectively. The results revealed that average particle size increases with increasing precursor molarity.

P-06

## Enhanced sensing behavior of Nickel ferrite-Cobalt chromate Composite for Humidity Sensor Applications

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**Abstract:** A new study has successfully reported on NiFe<sub>2</sub>O<sub>4</sub>/CoCr<sub>2</sub>O<sub>4</sub> nanocomposites through the chemical synthesis and mechanical mixing methods for the first time. The interaction of CoCr<sub>2</sub>O<sub>4</sub> and NiFe<sub>2</sub>O<sub>4</sub> was analyzed through X-ray diffraction and the morphology of the samples was studied with Field emission scanning electron microscopy. The results indicate that nonmetal elements act as interstitial ones to form the composite. As the amount of NiFe<sub>2</sub>O<sub>4</sub> increased, the morphology of the nanocomposites changed from near-spherical to irregular cubelike shapes, with their particle sizes increasing over 10 nm. Elemental analysis we studied using EDX technique. Additionally, the resistance and humidity sensing responses become more noticeable, with desorption occurring at a slower rate than adsorption. The sensor takes 10 seconds to react and 15 seconds to recover. These findings provide a potential approach to creating large-scale chromate-ferrite composite and improving their structural, morphological, and humidity sensing properties, making them excellent candidates for humidity sensor applications.

**Keywords:** Humidity, Composites, Morphology, Resistance

P-07

## Augmentation of red light emission by co-doping with Sr<sup>2+</sup> ion in Gd<sub>2</sub>O<sub>3</sub>:Pr<sup>3+</sup>- synthesized via facile solution combustion method

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**Abstract:** Sr<sup>2+</sup> co-doped Gd<sub>2</sub>O<sub>3</sub>:2wt% Pr<sup>3+</sup> nanophosphors were synthesized by low-temperature solution combustion method using citric acid as fuel. Structural studies were carried out using X-Ray diffraction analysis. The effect of Sr<sup>2+</sup> ion co-doping on light-emitting properties of Gd<sub>2</sub>O<sub>3</sub>: 2 wt% Pr<sup>3+</sup> was studied. Photoluminescence spectra exhibited three emission peaks at 613 nm (<sup>3</sup>P<sub>0</sub> to <sup>3</sup>H<sub>6</sub>), 529 nm (<sup>3</sup>P<sub>1</sub> to <sup>3</sup>H<sub>5</sub>) and 439 nm (<sup>3</sup>P<sub>2</sub> to <sup>3</sup>H<sub>4</sub>) upon the UV excitation of 321 nm. The Gd<sub>2</sub>O<sub>3</sub>:Pr<sup>3+</sup>:Sr<sup>2+</sup> phosphor shows luminescence emission intensity 1.78 times higher than that of the Gd<sub>2</sub>O<sub>3</sub>:Pr<sup>3+</sup> phosphor. The photometric parameters like CIE coordinates, CCT values, and colour purity were also computed. The prepared phosphors are anticipated to serve as a promising red component for applications in white light-emitting diodes.

**Keywords:** nanophosphors, luminescence, co-doping

### References

- (1) J. Su, X. Yang, L. Wang, C. Wang, and Y. Ji, 'Preparation, structure and optical properties of Pr:Gd<sub>2</sub>O<sub>3</sub> phosphor', *Materials Letters*, vol. 65, no. 19–20, pp. 2852–2854, Oct. 2011, doi: 10.1016/j.matlet.2011.06.017.
- (2) R. K. Tamrakar and K. Upadhyay, 'Optical properties of Gd<sub>2</sub>O<sub>3</sub>: Pr<sup>3+</sup> phosphor synthesized by combustion method using glycerine as a fuel', *J Mater Sci: Mater Electron*, vol. 28, no. 8, pp. 6112–6118, Apr. 2017, doi: 10.1007/s10854-016-6288-1.
- (3) R. Priya, O. P. Pandey, and S. J. Dhoble, 'Review on the synthesis, structural and photo-physical properties of Gd<sub>2</sub>O<sub>3</sub> phosphors for various luminescent applications', *Optics & Laser Technology*, vol. 135, p. 106663, Mar. 2021, doi: 10.1016/j.optlastec.2020.106663.

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P- 08

## SYNTHESIS AND PHOTOLUMINESCENCE PROPERTIES OF $\text{CaB}_2\text{O}_4:\text{xSm}^{3+}$ PHOSPHOR

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**Abstract:** In the present work, we have successfully produced  $\text{CaB}_2\text{O}_4:\text{xSm}^{3+}$  ( $x = 0.25, 0.5, 0.75, 1, \text{ and } 2$  mol%) phosphor solid state reaction method by using stoichiometric amount of  $\text{CaCO}_3, \text{H}_3\text{BO}_3, \text{Sm}_2\text{O}_3$ . Raw materials were ground well using mortar and pestle and heated in the furnace at  $600$  [Equation]C for 5 hours. Mixture was cooled and ground again for better homogeneity and kept in the furnace for 5 hours at  $900$  [Equation]C. The X-Ray Diffraction patterns of the sample was obtained and compared with the standard powder diffraction pattern for verification of formation of the compound. Optical properties were studied using Photoluminescence spectra and after that the optimum concentration of  $\text{Sm}^{3+}$  was determined using the same. Band gap of the material was determined using Diffused reflectance spectra. It was seen that the prepared phosphor also has high thermal stability and excellent optical properties which will make it an ideal choice of for possible optical, thermal, and energy related applications.

P- 09

## Innovative Approach to Combat Microbial Infections: Development and Characterization of JEFT-BC Antimicrobial Polymer

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**Abstract:** Microbial infections represent substantial issues in a variety of fields, including medical equipment, medicines, healthcare environments, water purification systems, textiles, food packaging, and storage. The rise of drug-resistant microorganisms constitutes a worldwide health hazard, which is worsened by their capacity to build biofilms that resist treatment. To address this, researchers have created antimicrobial polymers and polymer-coated surfaces. Antimicrobials have sparked attention in academic research and industry due to their potential to improve material quality and safety. Antimicrobial polymers have the potential to improve the efficacy of current antimicrobial drugs while resolving environmental problems associated with traditional antibiotics. Antimicrobial polymers rupture microbial cell membranes, whereas polymer coatings limit microbial adherence and biofilm development and have significant promise for treating microbial infections and their effect in a variety of applications. In the current article, we have reported the synthesis of a bifunctional coupler (BC) by reacting piperazine and epichlorohydrin followed by the addition of Jeffamine-T403 (JEFT) to obtain a functionalized polymer (JEFT-BC). The synthesized polymer was characterized by fourier-transform infrared spectroscopy (FTIR), <sup>1</sup>H-NMR, <sup>13</sup>C-NMR, and DEPT-135 for its structural confirmation and the thermal properties of the polymer were studied using Thermogravimetric analysis (TGA) & Differential scanning calorimetry (DSC). The antimicrobial property of JEFT-BC polymer was evaluated against *S. aureus*, *E. coli*, *M. smegmatis*, and *C. albicans* using disk-diffusion assay, and minimum inhibitory concentration was also determined using the optical density method at 600 nm and resazurin assay. The polymer was coated on a glass substrate and the stability of the coated material was tested in different pH and contact angle measurements were also done to check the hydrophilicity/hydrophobicity.

**Keywords:** Antimicrobial activity, piperazine-based polymer, microbial infections, coatings.

P- 10

## Highly-Stable Poly(*o*-methoxyaniline)/WO<sub>3</sub>-Nanoflower Composite-Based Electrochromic Supercapacitors with Real-Time Charge Indication

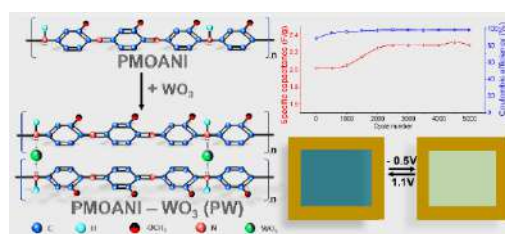
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**Keywords:** Poly(*o*-methoxyaniline), WO<sub>3</sub>, composites, supercapacitor, electrochromism, energy storage systems

**Abstract:** Polymer-based electrochromic supercapacitors (ECS) are state-of-the-art innovations that use color change to visually convey stored energy status in real-time.[1] However, the electrochemical instability of the polymers utilized in such devices limits their commercialization due to the difficulties in solution processibility and short charge-discharge cyclic life.[2,3] Herein, a simple and cost-effective chemical oxidative polymerization method is proposed for developing a highly stable and electrochromically active nanocomposite comprising of poly(*o*-methoxyaniline) (PMOANI) and WO<sub>3</sub> nanoflowers. The nanocomposite shows areal and specific capacitance of 83 mF/cm<sup>2</sup> and 133.16 F/g, respectively. Moreover, the practical multifunctionality of nanocomposite is demonstrated by developing ECS device (5 × 5 cm<sup>2</sup>), which shows energy density (370 mWh/kg) and power density (4 W/kg) with stable and prolonged charge-discharge cycles (>5000). Further, ECS device is utilized to power a timer display (1.2 V) for >20 min using the energy stored in the charged state (blue color), which changes its color during discharge, demonstrates its capability as a power source with real-time energy level indicator. It is expected that the polymer-metal oxide nanocomposite is certainly a promising candidate to replace the traditional polymers in ECS technologies to achieve prolonged stability for their application in modern electronic gadgets and infrastructures.



**Fig. 1:** Schematic representation of highly stable PMOANI-WO<sub>3</sub> (PW) nanocomposite with real-time charge indication through color-change

### References

[1] Yun *et al.*, *ACS Nano* 2019, 13 (3), 3141–3150.

[2] Wei *et al.*, *Journal of Physical Chemistry C* 2012, 116 (47), 25052–25064.

[3] Yuksel *et al.*, *Journal of Alloys and Compounds* 2016, 658, 183–189.

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P- 11

## Synthesis and characterization of highly fluorescent carbon dots

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**Abstract:** Perelyene derivatives are known for their stable emission properties and can be utilized for the fabrication of functional Carbon dots (CDs). CDs with desirable and photo-tunable emission property is synthesized via hydrothermal approach and purified via column chromatography. CDs appear quasi-spherical with size ranging from less than 10 nm with less toxicity. The UV-Visible spectroscopy depicts the major absorption in the visible and UV region of the spectrum of all the fractions. Hence, the CDs can display primary emissions in the visible region. The extent and accuracy of the purification is verified by the PL spectra wherein the fractions eluted presented distinct emission peaks. The fraction dispersed in non-polar solvent display emissions towards longer wavelength and fractions eluted after addition of polar solvent show emissions in shorter wavelength region. The eluted fractions having characteristic emission under UV illumination are reported to have higher quantum yield value as high as 63%. The elemental analysis of all the fractions displays carbon, oxygen, nitrogen and sodium. The Raman spectra of all the fractions display D and G band indicating the presence of distorted and graphitic carbon. The TEM imaging performed for different fractions show CDs having size < 10 nm. The SAED pattern obtained indicates the polycrystalline nature of the carbon dots.

**Keywords:** Dye precursor, Chromatography technique

### **References :**

- [1] Hinterberger, V., Damm, C., Haines, P., Guldi, D. M., & Peukert, W. (2019). Purification and structural elucidation of carbon dots by column chromatography. *Nanoscale*, 11(17), 8464–8474.
- [2] Lu, Y., Wang, J., Yuan, H., & Xiao, D. (2014). Separation of carbon quantum dots on a C18 column by binary gradient elution via HPLC. *Analytical Methods*, 6(20), 8124–8128. <https://doi.org/10.1039/C4AY01052C>.
- [3] Ding, H., Yu, S. B., Wei, J. S., & Xiong, H. M. (2016). Full-color light-emitting carbon dots with a surface-state-controlled luminescence mechanism. *ACS Nano*, 10(1), 484–491. <https://doi.org/10.1021/acsnano.5b05406>.

P- 12

## Luminescence properties of Sm<sup>3+</sup> doped Borosilicate glasses for orange red light emitting applications

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**Abstract:** The study presents the luminescence features of Sm<sup>3+</sup> borosilicate glasses for solid state lighting applications. Samarium doped borosilicate glass with chemical composition 20 SiO<sub>2</sub> – 40 B<sub>2</sub>O<sub>3</sub> – 10 Al<sub>2</sub>O<sub>3</sub> – 10 ZnO - 20 NaF – x Sm<sub>2</sub>O<sub>3</sub> (where x=0.1, 0.5,1,1.5, 2.0 and 2.5 mol%) were prepared using the conventional glass melt quench method. The physical parameters like density, refractive index, molar volume, inter-ionic distance, polaron radius were calculated. The structural characteristics of prepared glasses were investigated using X-Ray diffraction and Fourier Transform Infrared spectroscopy. The bandgap and various electronic states of Sm<sup>3+</sup> were studied using UV-Vis-NIR absorption spectroscopy. Photoluminescence (excitation and emission) characteristics showed that, strong reddish orange emission was observed under 402 nm excitation. The radiative properties like radiative transition probabilities, branching ratios and stimulated emission cross section were calculated. Decay dynamics and energy transfer processes were discussed. The calculated CIE color coordinates and color purity show that the color coordinates of the developed glasses lie in the orange red region. From the obtained results, the prepared glasses are potential for applications involving solid state lasers and orange red light-emitting diodes.

**Key words:** Glass melt quenching, Borosilicate glass, Orange red, Luminescence

### References:

- [1] M. Shoaib *et al.*, “Comparative study of Sm<sup>3+</sup> ions doped phosphate-based oxide and oxy-fluoride glasses for solid state lighting applications,” *J. Rare Earths*, vol. 37, no. 4, pp. 374–382, 2019, Doi: 10.1016/j.jre.2018.09.008.
- [2] J. Li, R. Wei, X. Liu, and H. Guo, “Enhanced luminescence via energy transfer from,” vol. 20, no. 9, pp. 10122–10127, 2012.

P- 13

## Fabrication of Large-Area, Affordable Dual-Function Electrochromic Smart Windows by Using a Hybrid Electrode Coated with an Oxygen-Deficient Tungsten Oxide Ultrathin Porous Film

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**Abstract:** Electrochromic (EC) devices are not commercialised extensively owing to their high cost. The best large area devices in the market suffer from not reaching a distinct dark coloured state [1]. These devices appear more like a blue tinted glass. While a better performance demands the use of appropriate components, the cost-effectiveness of such components is crucial for commercialisation. Specifically, the utilisation of cost-effective electrodes [2], thin WO<sub>3</sub> coatings and inexpensive electrolytes [3] are essential for reducing the cost of EC devices. Here, we report a high-performing porous WO<sub>3</sub> thin film (~ 130 nm) achieved by optimising the DC sputtering process parameters. This way, an affordable dual-function electrochromic energy storage (EES) device was fabricated, showing 84% transmittance modulation and a high-power density of 3036 mW/m<sup>2</sup> thus functioning simultaneously as transparency switching energy storage device. With a large area (900 cm<sup>2</sup>) device, we have demonstrated that the need for expensive ITO electrodes and Li<sup>+</sup> ion-based electrolytes can be eliminated by using hybrid electrode (ITO/Al-mesh) and multivalent Al<sup>3+</sup> ion-based electrolytes while not compromising the device performance. The findings of this study may revolutionize the EC device industry and their commercialization owing to inexpensive ingredients and their scalable processing.

**Keywords:** electrochromic; energy storage; sputtering; tungsten oxide (WO<sub>3</sub>); hybrid transparent electrode

**References:**

1. Granqvist, C. G. Electrochromics for Smart Windows: Oxide-Based Thin Films and Devices. *Thin Solid Films* 2014, 564, 1–38

2. Govind, R. K.; Mondal, I.; Baishya, K.; Ganesha, M. K.; Walia, S.; Singh, A. K.; Kulkarni, G. U. Large-Area Fabrication of High Performing, Flexible, Transparent Conducting Electrodes Using Screen Printing and Spray Coating Techniques. *Adv. Mater. Technol.* 2022, 7, 1–8.
3. Tian, Y.; Zhang, W.; Cong, S.; Zheng, Y.; Geng, F.; Zhao, Z. Unconventional Aluminum Ion Intercalation/Deintercalation for Fast Switching and Highly Stable Electrochromism. *Adv. Funct. Mater.* 2015, 25, 5833–5839



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## Development of an Electrochemical Sensor with MnO<sub>2</sub> Nanotubes for Sensitive Detection of Zinc (Zn) Ions in Water

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**Abstract:** The detection of metal ions is the most important aspect in achieving environmental protection and monitoring. In this detection of Zinc ions research, we report the development of electrochemical sensor modified with MnO<sub>2</sub> nanotubes on IDE structure. The MnO<sub>2</sub> nanotube material is used as a sensing material, which was electrochemically synthesized using hydro-thermal technique. The crystal phase and orientation of MnO<sub>2</sub> nanotubes were examined using an X-ray diffractometer (XRD). The surface morphology of the MnO<sub>2</sub> is characterized using field emission scanning electron microscopy (Fe-SEM) and energy-dispersive X-ray spectroscopy (EDS). Further, MnO<sub>2</sub> was coated on a silver interdigitated electrode to investigate the electrochemical sensing characteristics of the MnO<sub>2</sub> structure, and it was measured using a Kiethley instrument, showing the performance of the sensor that was investigated in the current (ampere) with respect to the voltage ranges -5V to +5V resulted I–V curve then showed the ohmic nature of sample. The results show that MnO<sub>2</sub> nanotubes can be successfully used for detection of Zn(II) with good sensitivity in water sample analysis.

## Interlayer Water of Tungsten Oxide Unlocks the Jahn-Teller Distortion to Boost the Performance of Aqueous Electrochromic Battery

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**Abstract:** Aqueous electrochromic batteries (ECB) have recently garnered significant attention within the realm of renewable rechargeable technology due to their potential applicability in diverse multifunctional devices, ranging from electrochromic windows in zero-energy buildings to wearable electronic gadgets featuring visible-level indicator batteries. However, there exists an imperative to comprehend the underlying structural factors that contribute to achieving elevated performance in both electrochromic and electrochemical operations. In this context, we have synthesized and compared  $\text{WO}_3 \cdot \text{H}_2\text{O}$  (HWO) specifically for heightened ECB application as against the performance of a standard annealed  $\text{WO}_3$  (AWO). To unravel the underlying cause, a density functional theory (DFT) investigation is carried out disclosing a structural deformation of HWO, unlike AWO, due to Jahn-Teller distortion (JTD) induced by the presence of interlayer water. It results in a fully compatible HWO ion host to devise a zinc ion aqueous electrolyte electrochromic battery exhibiting superior redox reactivity, greater optical modulation (50%), enhanced capacity (112 mAh/g), and improved cyclic stability. To glean insights into the dynamic structural alterations during the intercalation and deintercalation processes of  $\text{Zn}^{2+}$ , ex-situ X-ray diffraction (XRD) and Raman spectroscopic studies are carried out. These investigations culminate in the determination that HWO films are better suited for the application than their AWO counterparts. This finding holds promise for advancing the applications of ECBs and represents a significant step forward in this field.

## INVESTIGATION ON THERMOELECTRIC PERFORMANCE OF DIAMOND STRUCTURED $\text{Cu}_2\text{SnSe}_3$ SYSTEM

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**Abstract:** Copper (Cu), Tin (Sn), and Selenium (Se) has attracted attention as a potential thermoelectric material due to its unique electronic and thermal properties.  $\text{Cu}_2\text{SnSe}_3$  was prepared using the conventional solid state reaction technique followed by conventional sintering. The crystal structure was characterized using XRD and it reveals that the sample has a diamond cubic structure with space group of  $F\bar{4}3m$ . The electrical transport characteristics was studied at mid temperature range from 300 K to 650 K. The electrical resistivity increased as the temperature increased till 540 K showing degenerate semiconductor behaviour, but after 540 K the resistivity decreases as the temperature increases showing semiconductor behaviour. Seebeck coefficient was positive which revealed that most of the charge carriers were holes and from the Hall measurements we obtain a carrier concentration of  $1.53 \times 10^{18} \text{ cm}^{-3}$ . Since the carrier concentration and Seebeck coefficient is positive, we infer that the material is a p-type semiconductor. At 572 K the power factor obtained was  $101 \mu\text{W m}^{-1}\text{K}^{-2}$  which makes it suitable for thermoelectric applications.

**Keywords:** Thermoelectrics; Chalcogenides; Power factor; Carrier concentration.

### *References:*

- [1] S.-P. Deng *et al.*, "Structural features and thermoelectric performance of Sb- and Bi-doped  $\text{Cu}_2\text{SnSe}_3$  compounds," *Rare Metals*, vol. 40, doi: 10.1007/s12598.
- [2] D. Beretta *et al.*, "Thermoelectrics: From history, a window to the future," *Materials Science and Engineering R: Reports*, vol. 138. Elsevier Ltd, Oct. 01, 2019. doi: 10.1016/j.mser.2018.09.001.
- [3] H. J. Goldsmid, "Springer Series in Materials Science 121 Introduction to Thermoelectricity." [Online]. Available: <http://www.springer.com/series/856>.
- [4] J. Zhang *et al.*, "Realized high power factor and thermoelectric performance in  $\text{Cu}_2\text{SnSe}_3$ ," *Scr Mater*, vol. 159, pp. 46–50, Jan. 2019, doi: 10.1016/j.scriptamat.2018.09.010.

## INVESTIGATION ON LOW AND MID-TEMPERATURE THERMOELECTRIC PERFORMANCE OF $\text{Cu}_2\text{SnSe}_3$ SYSTEM

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**Abstract:**  $\text{Cu}_2\text{SnSe}_3$  has emerged as a useful thermoelectric material because of its long-term stability and non-toxic constituent elements along with lesser thermal conductivity and changeable electrical conductivity. In the present study,  $\text{Cu}_2\text{SnSe}_3$  was synthesized using the traditional solid-state reaction followed by conventional sintering and its thermoelectric performance has been studied. XRD characterisation reveals that sample has a diamond cubic structure in the F43M space group. Semiconductor type behaviour of the sample is verified using low resistivity measurement between 12 K to 350 K and from Hall measurement we obtained carrier concentration as a positive value of  $1.53 \times 10^{18} \cdot \text{cm}^{-3}$  which implies that sample is a p-type semiconductor. Power factor value of  $14 \mu\text{W m}^{-1} \text{K}^{-2}$  is obtained at 300 K. So, this work provides a method for raising the average ZT values of  $\text{Cu}_2\text{SnSe}_3$ -based compounds for power generation application at intermediate temperatures.

**Keywords:** Thermoelectrics; Carrier concentration; Chalcogenides; Power factor.

### References:

- [1] D. Beretta et al., "Thermoelectric: From history, a window to the future," *Materials Science and Engineering R: Reports*, vol. 138. Elsevier Ltd, Oct. 01, 2019. doi: 10.1016/j.mser.2018.09.001.
- [2] "D.M. Rowe and C.M. Bhandari - Modern Thermoelectrics (1983)".
- [3] L. Yang, Z. G. Chen, M. S. Dargusch, and J. Zou, "High Performance Thermoelectric Materials: Progress and Their Applications," *Advanced Energy Materials*, vol. 8, no. 6. Wiley-VCH Verlag, Feb. 26, 2018. doi:10.1002/aenm.201701797.
- [4] R. Thomas, A. Rao, C. Y. Chung, Y. K. Kuo, and B. Shivamurthy, "Investigation of thermoelectric properties of  $\text{Cu}_2\text{SnSe}_3$  composites incorporated with SnSe,"

Physica B Condens Matter, vol. 596, Nov. 2020, doi:  
10.1016/j.physb.2020.412411.

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## One-pot preparation and self-luminescence property of $\text{CaMoO}_4$ via solid-state route

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**Abstract:** In this study, the  $\text{CaMoO}_4$  compound exhibits intrinsic luminescence properties at room temperature. A self-activated  $\text{CaMoO}_4$  sample was prepared by the solid-state route. The PXRD pattern is well matched with the standard JCPDS No. 29-0351. Rietveld refinement of the XRD result reveals the as-prepared  $\text{CaMoO}_4$  is in a scheelite-type tetragonal structure with space group  $I4_1/a$ . The SEM micrographs reveal that the particles exhibit an irregular agglomerated morphology with an average particle size of around 7.31  $\mu\text{m}$ . The FTIR and Raman results confirm the monophasic nature of  $\text{CaMoO}_4$  synthesised by the solid-state route. The scheelite structure of  $\text{CaMoO}_4$  allows a direct transition with a band gap of 3.91 eV, which can be calculated with the help of Kubelka-Munk plots. PL results reveal that the phosphor emits a broad emission peak centred at 502 nm, excited at a 302 nm excitation wavelength. The CIE 1931 chromaticity diagram confirms that the prepared sample is in the bluish-green region.

**Key words:** One-pot preparation, self-luminescence, scheelite, photoluminescence

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## SYNTHESIS AND PHOTOLUMINESCENCE PROPERTIES OF $\text{Ca}_2\text{MgWO}_6$ : $\text{Dy}^{3+}$ PHOSPHOR

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**Abstract:** In the present work, we have successfully synthesized  $\text{Ca}_2\text{MgWO}_6$ :  $\text{Dy}^{3+}$  phosphors using a high-temperature solid-state reaction method. Raw materials were ground well using mortar and pestle and heated in the furnace at 600 °C for 5 hours. The mixture was cooled and ground again for better homogeneity and kept in the furnace for 5 hours at 1200 °C. The prepared sample was analyzed by using various characterization techniques. X-ray diffraction patterns of the sample were obtained and compared with the standard powder diffraction pattern for verification of the formation of the compound. Fourier Transformed Infrared spectroscopy was used to identify different bonds in the sample and the optical properties were studied using Photoluminescence spectra of the compound. The reflectance and band gap of the optimized phosphor was determined using diffused reflectance spectra. Finally, the thermal studies for the prepared phosphors showed that the  $\text{Ca}_2\text{MgWO}_6$ :  $\text{Dy}^{3+}$  phosphor had good thermal stability making them a choice for possible optical, thermal, and solar energy-related applications.

## IMPACT OF MAGNETRON TILT ANGLE ON THE STRUCTURAL PROPERTIES OF CONFOCAL SPUTTERED ALUMINIUM NITRIDE THIN FILMS

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**Abstract:** Aluminum nitride (AlN) thin films sputter deposited at low temperature is promising material for piezoelectric MEMS. The crystallinity and structural property of the grown thin film will strongly depend on the sputtering parameters. The tilt angle of the confocal magnetron is one such parameter which controls the sputtering yield and kinetic energy of sputtered atom, which is preferable for obtaining highly oriented AlN thin films, essential for piezoelectric application of AlN. However, this crucial parameter is not widely investigated compared to other growth parameters such as sputter power, pressure, and nitrogen concentration etc. Also, the confocal arrangement of magnetron is essential for co-sputtering in case of doping and sequential deposition for obtaining multilayers. In addition, controlling the plasma direction is essential since they mutually repel due to the presence of mirror magnetic field. Generally, the confocal arrangement requires large target to substrate distances ( $> 12$  cm) to have thickness uniformity up to 4-inch diameter of wafers, but it hinders the kinetic energy of sputtered atoms which adversely affects the orientation of the grown AlN films [1],[2]. Due to this, there is a need for optimizing the sputtering parameters like tilt angle to compensate for the effects. In this study, tilt angles varied ( $\alpha= 30^\circ, 40^\circ, 50^\circ$  and  $60^\circ$ ) to observe the direction of plasma in single active magnetron and plasma focal point for the dual magnetron due to mirror magnetic field. The angle above  $40^\circ$  resulted in plasma repulsion such that no focal point for dual magnetron and plasma at away from the center of the substrate for the single active magnetron. Further, we successfully deposited (002) oriented AlN films at room temperature using single active magnetron at two tilt angles ( $\alpha= 30^\circ$  and  $40^\circ$ ) and its structural properties were compared. The calculated crystallite size was larger (42.3 nm), and stress were less (0.97 GPa) for AlN grown at tilt angle  $40^\circ$  when compared with 18.4 nm and 1.7 GPa respectively for AlN grown at  $30^\circ$ . The obtained (002) oriented AlN are suitable for piezoelectric MEMS applications.

**Keywords:** Aluminium Nitride; Sputtering; Piezoelectricity; Thin films.



**References:**

- [1] M. Trant, M. Fischer, K. Thorwarth, S. Gauter, J. Patscheider, and H. J. Hug, "Surface & Coatings Technology Tunable ion flux density and its impact on AlN thin films deposited in a confocal DC magnetron sputtering system," *Surf. Coat. Technol.*, no. December 2017, pp. 0–1, 2018, doi: 10.1016/j.surfcoat.2018.04.091.
- [2] Z. Chen, C. Li, Y. Chen, S. Chu, C. Tsai, and C. Hong, "Enhancement of c-Axis Oriented Aluminum Nitride Films via Low Temperature DC Sputtering," vol. 21, no. 16, pp. 17673–17677, 2021.

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## Synthesis of TiO<sub>2</sub> nanoparticles using TTIP precursor by sol-gel method

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**Abstract:** Titanium dioxide (TiO<sub>2</sub>) nanoparticles were synthesized by sol-gel method. Titanium tetra isopropoxide (TTIP) was taken as the precursor, ethanol as the solvent and HCl to adjust the pH of the synthesis solution. For the preparation of TiO<sub>2</sub>, 4 ml TTIP precursor was added dropwise to 30 ml of ethanol under constant stirring for about 15 minutes using magnetic stirrer and after that 60 ml of distilled water was added and stirred again for 10 minutes. Then, HCl was added in an amount that was necessary to achieve a desired pH. Resulting solution was further stirred for 2 hours at room temperature. Then, raised the temperature to 125 °C and maintained at this temperature for an hour which resulted in the formation of the sol-gel. The prepared sol-gel was initially heated at 300°C for 2 hours and then increase the heating temperature to 400°C and heated for 1 hour resulting in the formation of white coloured TiO<sub>2</sub> powder. The prepared TiO<sub>2</sub> powder was characterized by powder XRD, FESEM, EDX, Raman spectroscopy, and UV-visible spectroscopy. The XRD and Raman studies show the formation mixed phase of TiO<sub>2</sub> nanoparticles, anatase, rutile, and brookite, with anatase as the major phase. The energy band gap obtained from the Tauc plot of the UV-visible absorption data shows the direct band gap nature of the synthesized TiO<sub>2</sub> nanoparticles. Photo catalytic activity of the synthesized TiO<sub>2</sub> nanoparticles were evaluated using methylene blue (MB) [1].

**Keywords:** *TiO<sub>2</sub>; Sol-gel method; Raman spectroscopy*

### **Reference:**

1. David Dodoo-Arhin, Frederick Paakwah Buaben, Julius M. Mwabora, Prince Nana Amaniampong, Henry Agbe, Emmanuel Nyankson, David Olubiyi Obada, Nana Yaw Asiedu, *The effect of titanium dioxide synthesis technique and its photocatalytic degradation of organic dye pollutants, Heliyon 4 (2018). doi: 10.1016/j.heliyon.2018*

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## Synthesis of TiO<sub>2</sub> nanoparticles using TTIP precursor by sol-gel method

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**Keywords:** TiO<sub>2</sub>; Sol-gel method; Raman spectroscopy

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1. David Dodoo-Arhin, Frederick Paakwah Buaben, Julius M. Mwabora, Prince Nana Amaniampong, Henry Agbe, Emmanuel Nyankson, David Olubiyi Obada, Nana Yaw Asiedu, *The effect of titanium dioxide synthesis technique and its photocatalytic degradation of organic dye pollutants, Heliyon 4 (2018)*. doi: 10.1016/j.heliyon.2018

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## **Numerical Study on Effect of Solid-fluid Interaction Parameter on Surface Wettability with Irregular Triangular Micropillars Using Lattice Boltzmann Method**

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**Abstract:** In this study, we present the numerical investigation of the surface wettability with irregular triangular micropillars using a two-dimensional (2D) pseudo-potential multiphase lattice Boltzmann method with a D2Q9 model for various solid-fluid interaction parameters of the range from -1.30 to -2.20. Firstly, the simulation of the equilibrium state of a water droplet on a smooth surface is considered with various interaction parameters to examine the accuracy of the present numerical model. We then imposed the microscale irregular triangular pillars at the bottom of the surface with different heights of the pillars to study the behavior of water droplets on the micropillars. We have taken a water droplet of radius 100 lattice units in the domain of 800x800 lattice units for the study and analyzed the wettability by measuring the contact angle. The study shows that increasing the solid-fluid interaction parameter of the pillars dramatically reduces the contact area between water droplets and solid walls due to the momentum redirection phenomenon.

**Keywords:** Wettability; Contact angle; Water droplet; Lattice Boltzmann method

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## Pt-Pd-Co-Mn-Ni High Entropy Alloy as an Efficient Saline Water Electrocatalyst for Hydrogen Evolution Reaction

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**Abstract:** High entropy alloys (HEA) which come under the family of multicomponent alloys, are catching the attention of researchers from academia and industry due to their unusual properties, which are promising for the hydrogen economy.[1] The combination of multiple elements forming a complex stable high entropy structure with large active sites ensures high catalytic activity and stability.[2] Alkaline water electrolysis is an intense subject of research and an appealing process in terms of low carbon footprint, safety and stability, that works at low voltage.[3] The development of cathode materials for hydrogen evolution reaction (HER) and that guarantees low cost, strong catalytic activity with lower overpotential and high electrochemical stability in alkaline electrolytes needs more investigation for commercialization. Synergism in optimizing the electronic structure is the attractive feature of HEA towards HER catalysts.

We have developed Pt-Pd-Co-Mn-Ni HEA by electrodeposition method on carbon paper. Fcc cubic structure formed with a configurational entropy value of 1.55 R confirms the formation of high entropy alloy. The optimization of the solution for electrodeposition is followed by potential optimization using linear sweep voltammetry by choosing the best catalyst for HER. Among the different potentials chosen for the electrodeposition, an optimized potential with a very low value of overpotential which is 22.62 mV at  $-10 \text{ mAcm}^{-2}$  with a Tafel slope value of  $82 \text{ mV dec}^{-1}$  outperforms the commercial Pt/C. It has a very high electrochemical surface area of  $421 \text{ cm}^2$  and low charge transfer resistance. The catalyst has shown very good electrocatalytic stability at a high current density of  $100 \text{ mA cm}^{-2}$  even for 36 h. The material has shown good HER activity in simulated seawater with an overpotential value of 61.7 mV at  $-10 \text{ mAcm}^{-2}$  which can be used for practical application. For checking its applicability in sea water electrolysis, the HEA has shown a low value of overpotential of 62 mV at  $-10 \text{ mAcm}^{-2}$  indicating good HER activity. So, Pt-Pd-Co-Mn-Ni HEA material can be a replacement for the current commercial catalyst Pt/C in terms of its HER activity and cost.

**Keywords:** High-entropy alloy, Electrodeposition, hydrogen evolution reaction, sea water electrolysis

*References (limited to 4):*

- [1] E. P. George, D. Raabe, and R. O. Ritchie, "High-entropy alloys," *Nature Reviews Materials*, vol. 4, no. 8. Nature Publishing Group, pp. 515–534, Aug. 01, 2019. doi: 10.1038/s41578-019-0121-4.
- [2] Z. Zhang *et al.*, "Recent research progress on high-entropy alloys as electrocatalytic materials," *Journal of Alloys and Compounds*, vol. 918. Elsevier Ltd, Oct. 15, 2022. doi: 10.1016/j.jallcom.2022.165585.
- [3] D. Yao, L. Gu, B. Zuo, S. Weng, S. Deng, and W. Hao, "A strategy for preparing high-efficiency and economical catalytic electrodes toward overall water splitting," *Nanoscale*, vol. 13, no. 24. Royal Society of Chemistry, pp. 10624–10648, Jun. 28, 2021. doi: 10.1039/d1nr02307a.

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## Microstructural Evolution of DC Magnetron Sputtered Nb Thin Films: Interplay of Deposition Parameters and Structure Zone Transitions

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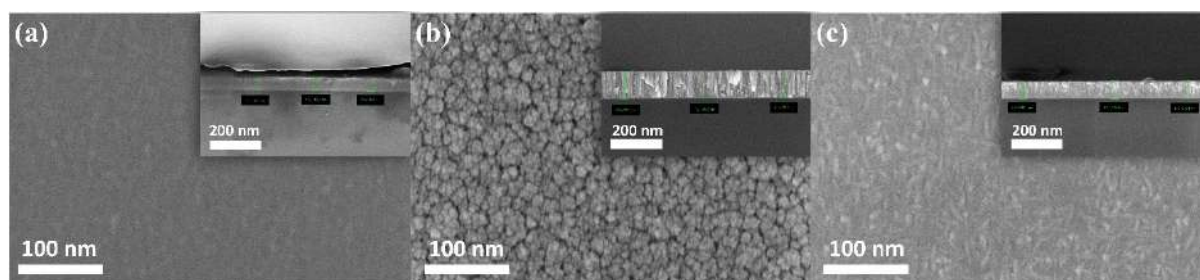
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**Abstract:** Niobium (Nb) films of varying thicknesses were deposited onto Si wafers with amorphous SiO<sub>2</sub> layers via pulsed DC magnetron sputtering[1]. This study aimed to understand how varying processing parameters, chiefly temperature, and gas pressure, influence the Nb films' morphological, crystalline, and structural attributes. SEM analysis revealed Sample 1 (a) exhibited porous structures, aligning with its Zone 1 categorization in the Structure Zone Model (SZM)[2]. Conversely, Sample 2 (b) displayed columnar structures, situated between Zones 1 and 2. Sample 3 (c), with its denser nano-flakes morphology, corresponds to Zone 2 or the transition to Zone 3. Furthermore, grazing incidence XRD elucidated the films' microstructure, orientation, and grain size. Collectively, these insights pave the way for refining deposition conditions, potentially benefiting sectors like electronics, energy, and aerospace.

**Keywords:** Nb films; pulsed DC magnetron sputtering; Structure Zone Model; Grazing Incidence XRD.



**Fig. 1:** (a) Sample 1 (inset shows the cross-sectional image for determining the thickness of the film), (b) Sample 2, and (c) Sample 3

*References:*

- [1] B. Okolo, P. Lamparter, U. Welzel, and E. J. Mittemeijer, “Stress, texture, and microstructure in niobium thin films sputter deposited onto amorphous substrates,” *J Appl Phys*, vol. 95, no. 2, pp. 466–476, Jan. 2004, doi: 10.1063/1.1631733.
- [2] R. Messier, ; A P Giri, R. A. Roy, and A. P. Giri, “Revised structure zone model for thin film physical structure,” *Journal of Vacuum Science & Technology A*, vol. 2, no. 2, pp. 500–503, Apr. 1984, doi: 10.1116/1.572604.



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## ELECTRICAL AND OPTICAL STUDIES OF CHITOSAN BASED POLYMER ELECTROLYTE DOPED WITH SODIUM CARBONATE

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**Abstract:** In the present work, solid polymer electrolyte (SPEs) composed of chitosan was prepared with different weight percentage of sodium carbonate which acts as ion donor. The polymer electrolyte films were prepared by solution casting technique. The results of electrical impedance spectroscopy (EIS) indicate that the bulk resistance decreased with increasing salt concentration. From EIS measurement, the highest value of conductivity at ambient temperature was found to be  $6.09 \times 10^{-7} \text{ S cm}^{-1}$  for the sample containing 20 wt.% of sodium carbonate. UV-Visible spectroscopy was used to find the band gap of the highest conducting polymer electrolyte and is found to be 4.4 eV. The potential stability of the highest conducting film was found to be 3.5 V as well as shows the characteristics of an ionic conductor where  $t_{\text{ion}} > t_{\text{e}}$ . Ions were found to be the dominant charge carriers in the polymer electrolyte. The ion transference number ( $t_{\text{ion}}$ ) was found to be 0.84.

**Keywords:** Biopolymer electrolyte; Sodium Carbonate; Impedance study

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## Characterization of 2-inch x 2-inch NaI Detector

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**Abstract:** Nuclear radiation detectors are most fundamental instruments in the field of nuclear physics. Scintillator detectors are one of the useful detectors. Characterization of the detector is necessary as it is important to obtain accurate results in experimental research.

In the present work characterization of sodium iodide (NaI) scintillator present at MIT campus is done. Energy calibration was done. The absolute efficiency, energy resolution of the detector were determined experimentally for 662keV, 1173.2keV and 1332.5keV photon energies obtained from  $^{60}\text{Co}$  and  $^{137}\text{Cs}$  radioactive sources. The efficiency for the above mentioned energies were calculated for different distances (5cm, 10cm, 15cm, 20cm) as well. The variation of efficiency of the detector with distance was studied in the work.

**Key words:** Scintillator detector, NaI detector, Efficiency, Resolution.

### References:

- [1] I. Akkurt, K. Gunoglu, and S. S. Arda, "Detection Efficiency of NaI(Tl) Detector in 511–1332 keV Energy Range," *Science and Technology of Nuclear Installations*, vol. 2014, p. e186798, Mar. 2014, doi: 10.1155/2014/186798.
- [2] G. F. Knoll, *Radiation Detection and Measurement*. John Wiley & Sons, 2010.

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# UNPRECEDENTED INVESTIGATION ON LUMINESCENCE PROPERTIES OF CLITORIA TERNATEA EXTRACT AS A FUNCTION OF CONCENTRATION

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**Abstract:** An eco-friendly, sustainable, and green experiment is designed to examine the luminescence property of clad natural plant extracts, which have drawn a lot of interest because of their greater environmental compatibility, affordability, and nontoxicity. Among freshly prepared dyes of some natural extracts, Clitoria ternatea extract produced the best results under photoluminescence and UV-visible spectroscopy. The PL spectra gave both red and blue emission at wavelength 400-500 nm and 600-650 nm ranges respectively. Thin films of Clitoria ternatea were fabricated using the dip coating method, and its PL characterization was performed. Since this extract loses its luminescence property with time, it was complexed with yttrium oxide to enhance its luminescence and prevent aging. A series of complexes were synthesized in Y<sub>2</sub>O<sub>3</sub>: extract ratio of 1: x (x = 1, 2, 3, 4, and 5). From the luminescence study, it can be concluded that maximum efficiency is achieved when Clitoria ternatea extract and Yttrium oxide are taken in the same concentration (1: 1). The Y<sub>2</sub>O<sub>3</sub>: extract complex gave a broad range visible spectrum with ideal white emission, which has potential applications in wLED fabrication.

**Keywords:** Clitoria ternatea; Photoluminescence; Y<sub>2</sub>O<sub>3</sub>; White light emitting diodes

**Reference**

1. Veena, V.P., Shilpa, C.K., Jasira, S.V., Vini, K. and Nissamudeen, K.M., 2023. Adroit low-temperature synthesis and origin of blue–yellow–red emission in activated  $\text{La}_{2-x}\text{Dy}_x\text{MgTiO}_6$  novel perovskite phosphor for WLED. *Journal of Materials Science: Materials in Electronics*, 34(10), p.870.
2. Lakhera, S., Devlal, K., Rana, M. and Celik, I., 2023. Study of nonlinear optical responses of phytochemicals of *Clitoria ternatea* by quantum mechanical approach and investigation of their anti-Alzheimer activity with in silico approach. *Structural Chemistry*, 34(2), pp.439-454.
3. Hasanah, N.N., Mohamad Azman, E., Rozzamri, A., Zainal Abedin, N.H. and Ismail-Fitry, M.R., 2023. A Systematic Review of Butterfly Pea Flower (*Clitoria ternatea* L.): Extraction and Application as a Food Freshness pH-Indicator for Polymer-Based Intelligent Packaging. *Polymers*, 15(11), p.2541.
4. Sundaravalli, V.M. and Kowsalya, R., Phytochemical Profiling and In vitro Antioxidant Potential of *Clitoria ternatea* Linn seeds.

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# AS A FUNCTION OF TEMPERATURE; UNPRECEDENTED INVESTIGATION ON LUMINESCENCE PROPERTIES OF CLITORIA TERNATEA EXTRACT

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**Abstract:** Natural plant dyes are an example of an eco-friendly luminescent material that has garnered a lot of interest due to its non-toxicity, affordability, robust fluorescence emissions, and superior environmental compatibility. Pomegranate, red cabbage, turmeric, aloe vera, and butterfly pea flower (*Clitoria ternatea*) are few among the extracts that have selected for the luminescence study. An eco-friendly approach to study the latent properties of natural extracts is designed where the freshly prepared extracts of turmeric, red cabbage, aloe vera, pomegranate, and *Clitoria ternatea* were taken and subjected to photoluminescence and UV-Visible spectroscopy. The *Clitoria ternatea* extract gave broad and near ideal white emission spectrum, which has several potential applications in display devices and LEDs. In order to enhance luminescence property, *Clitoria ternatea* - yttrium oxide (1:1) complexes are synthesised at 100 °C, 120 °C, 150 °C, 180 °C. Through Photoluminescence characterization, the temperature optimization is done and found that the complex performs the best when heated at a temperature of 100 °C. Raising the temperature experienced a loss in luminescence property. From XRD characterization, it is inferred that when temperature rises, the compound size falls. This investigation led to the conclusion that the compound performs best at a 1:1 ratio and 100 °C.

**Keywords:** *Clitoria ternatea*; Photoluminescence; Y<sub>2</sub>O<sub>3</sub>; White light emitting diodes

## Reference

1. Veena, V.P., Shilpa, C.K., Jasira, S.V., Vini, K. and Nissamudeen, K.M., 2023. Adroit low-temperature synthesis and origin of blue–yellow–red emission in activated

- La<sub>2-x</sub>Dy<sub>x</sub>MgTiO<sub>6</sub> novel perovskite phosphor for WLED. *Journal of Materials Science: Materials in Electronics*, 34(10), p.870.
2. Lakhera, S., Devlal, K., Rana, M. and Celik, I., 2023. Study of nonlinear optical responses of phytochemicals of *Clitoria ternatea* by quantum mechanical approach and investigation of their anti-Alzheimer activity with in silico approach. *Structural Chemistry*, 34(2), pp.439-454.
  3. Hasanah, N.N., Mohamad Azman, E., Rozzamri, A., Zainal Abedin, N.H. and Ismail-Fitry, M.R., 2023. A Systematic Review of Butterfly Pea Flower (*Clitoria ternatea* L.): Extraction and Application as a Food Freshness pH-Indicator for Polymer-Based Intelligent Packaging. *Polymers*, 15(11), p.2541.
  4. Sundaravalli, V.M. and Kowsalya, R., Phytochemical Profiling and Invitro Antioxidant Potential of *Clitoria ternatea* Linn seeds.

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## Development of magnesium ion conducting solid polymer electrolytes based on Hydroxy Propyl Methyl Cellulose; A glimpse on microstructural analysis

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**Abstract:** In the present work, we propose to study the microstructural modification of Hydroxy Propyl Methyl Cellulose (HPMC) based magnesium ion conducting solid polymer electrolyte films. The electrolyte systems were prepared using the solution casting technique. Different concentrations of HPMC and magnesium acetate salts were dissolved in water and stirred mechanically to obtain a homogeneous solution which was then cast into Petri dishes and kept in a hot air oven to obtain solvent-free films. The prepared electrolyte systems were then subjected to different characterizations. FTIR and XRD analysis of the electrolyte systems account for the complexation of the polymer matrix and enhancement in the amorphous nature of the polymer matrix. Electrochemical Impedance Analysis of the electrolyte systems accounts for the enhancement of the electrical properties with the incorporation of the salt into the matrix. Electrolyte systems exhibit a room temperature ionic conductivity of the order of  $10^{-4}$  S/cm. An energy storage device has been fabricated using the highest conducting electrolyte system and its characteristics have been studied.

**KEYWORDS:** Solid polymer electrolytes, magnesium ion conducting, Hydroxy Propyl Methyl Cellulose, ionic conductivity, energy storage device

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## PROPERTY EVALUATION OF CHROMIUM OXIDE THIN FILMS GROWN BY DC MAGNETRON SPUTTERING

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### ABSTRACT

**Abstract:** Cr<sub>2</sub>O<sub>3</sub> is one of the extensively researched semiconductor transition metal oxides due to its attractive physical and chemical properties. We report a detailed study on the influence of thermal annealing on the physical properties of Cr<sub>2</sub>O<sub>3</sub> films grown by reactive DC Magnetron Sputtering. Cr<sub>2</sub>O<sub>3</sub> films were grown on glass substrates and were annealed at 300°C and 400°C. The effect of annealing on the structural, optical, morphological, and electrical properties was studied. The structural studies were carried out by X-ray diffractometer (XRD) which reveal that Cr<sub>2</sub>O<sub>3</sub> deposited at room temperature was amorphous in nature whereas the annealed films showed a polycrystalline nature. The average crystallite size was calculated from the spectra and was found to increase in the range from 1 to 4 nm with an increase in annealing temperature. The optical studies were carried out using a UV-spectrophotometer. The results showed an average transmittance of the film increased to 85% due to annealing. The band gap has increased in the range of 2.82eV to 2.95eV with an increase in annealing temperature. The surface studies were carried out by Atomic Force microscopy (AFM) which showed an increase in surface roughness with an increase in annealing temperature. The extracted electrical properties infer n-type and p-type conductivity depending on the processing condition which might be suitable for device applications.

**Keywords:** Chromium Oxide, thermal annealing, carrier type



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## INVESTIGATION OF STRUCTURAL AND OPTICAL PROPERTIES OF BALAZNNBO<sub>6</sub> PHOSPHORS

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**Abstract:** In the present work, we have successfully synthesized double perovskite BaLaZnNbO<sub>6</sub> (BLZN) phosphor using high temperature solid state reaction method. Using BaCO<sub>3</sub>, La<sub>2</sub>O<sub>3</sub>, ZnO and Nb<sub>2</sub>O<sub>5</sub> precursors in their stoichiometry ratio grounded well and heated at 1300°C for 10 hours. With the use of several characterization procedures, the produced phosphor is analysed. For the purpose of confirming the compound's synthesis, the sample's X-Ray diffraction patterns were collected and compared to a reference powder diffraction pattern. Fourier Transformed Different bonds in the sample were identified using infrared spectroscopy. Using the prepared phosphors photoluminescence spectra, optical characteristics were investigated. It was observed that BLZN has an emission peak at uv region for an excitation wavelength of 375 nm. Diffused reflectance spectra were utilised to calculate the material's band gap. All of these findings demonstrate that double perovskite phosphor can be produced via the high temperature solid state reaction technique. Additionally, BLZN delivers good optical qualities and strong thermal stability, making it a good choice of matrix for potential applications involving optical and thermal sensors.

## A Study of Microstructural And Electromechanical Properties of Spray Pyrolyzed Bismuth Ferrite Thin Film

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**Abstract:** The lead-free perovskite is the most exciting material for optoelectronic applications. Bismuth ferrite, one of such multiferroic materials with broad applications, was synthesized by Spray pyrolysis, a simple and large-scale deposition technique. The functional bismuth ferrite thin film is deposited on an economical glass substrate. Annealing is considered the main parameter to tailor the properties of the deposited film. The effect of annealing on the structural, compositional, optical, and piezoelectrical properties of the deposited films was studied in detail. The rhombohedral structured material gives strong imprints of ferroelectric domains, and the polycrystalline film exhibits switchable polarization. The low energy band gap 2.5eV, which allows visible light absorption from the material, and the room temperature functional properties of the spray-coated thin films offer promising industrial applications. Our study thus sheds light on the vital role of annealing in controlling and tuning the microstructural and piezoelectric properties of the spray pyrolyzed BFO films.

**Keywords:** Bismuth ferrite; spray pyrolysis; structural characterization; ferroelectricity.

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## Vanadium Substituted Tungsto-Molybdo-Silicate Embedded Polypyrrole Nanohybrid for Supercapacitor Application

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**Abstract:** Supercapacitors (SC) with hybrid electrode materials became advanced electrochemical storage devices in energy storage technology due to their unique characteristics, such as ample storage capacity, quick charging, and longer cycle life. In this work, we synthesized potassium 9-tungsto-2-molybdo-1- vanadosilicate  $K_5[\alpha\text{-SiMo}_2\text{VW}_9\text{O}_{40}]\cdot 10\text{H}_2\text{O}$  (POM) and Polypyrrole (PPy) combined nanohybrid, named as PPy-POM and used it for SC application. Various characterization such as XRD, FTIR, FESEM, TGA, etc., were performed to study the structural and morphological features of the nanohybrid. This pseudocapacitive hybrid material has shown a positive response in SC application because of its redox properties. PPy-POM nanohybrid material showed a specific capacitance of 174.5F/g with energy and power densities of 15.51 Wh/kg and 799.94 W/kg respectively, at 0.5 A/g current density in 0.5M H<sub>2</sub>SO<sub>4</sub> electrolyte solution. The nanohybrid material showed 72.66 % diffusion and 27.34% capacitive contribution at a 100mV/s scan rate, which suggests the diffusion process is dominating the charge storage mechanism<sup>1,2</sup>. Figure 1 shows (a) BET analysis, (b) CV, and (c) capacitive and diffusion behavior percentage of the PPy-POM nanohybrid.

**Keywords:** Polyoxometalates (POM), Polypyrrole (PPy), Supercapacitor, Pseudocapacitance.

### References:

(1) Vannathan, A. A.; Maity, S.; Kella, T.; Shee, D.; Das, P. P.; Mal, S. S. In Situ

Vanadophosphomolybdate Impregnated into Conducting Polypyrrole for Supercapacitor.

Electrochimica Acta 2020, 364, 137286. <https://doi.org/10.1016/j.electacta.2020.137286>.

## A 3-Hydroxyflavone derivative as ESIPT-induced potential dual emitter with large Stoke's shift for Display applications

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**Abstract:** A new dual emitter 2-(5-bromothiophen-2-yl)-3-hydroxy-4*H*-chromen-4-one was synthesized via the Algar-Flynn-Oyamada reaction. The UV absorption and fluorescence spectra of the compound were recorded in an ethanolic medium which revealed interesting results. The compound unveiled two major absorption bands at 247 nm and 342 nm corresponding to the ring A and ring B system of the compound. The subsequent excitation at 247 nm and 342 nm, triggered the emission bands to be observed at 402 nm and 531 nm due to the Excited State Intramolecular Proton Transfer (ESIPT) phenomenon that results in enol (N\*) and tautomeric (T\*) excited forms. The fluorescence emission of N\* and T\* displayed two distinct bands. The participation of a dual emitter in intermolecular hydrogen bonding with the polar ethanolic medium allowed the compound to be present in solvated-tautomeric excited form which could hamper the actual ESIPT process. Apart from solvent influence, other competing factors such as molecular aggregation and chemical substitution could also affect the intensity of the emission band leading to blue and green emission with a large Stoke's shift value of 60-189 nm. This peculiar dual emitting phenomenon enables the molecules to be utilized as an OLED or sensor material.

**Keywords:** Dual emitter, Fluorescence, ESIPT, Stoke's shift

### References:

- [1] B. S. Dayananda, B. K. Sarojini, Q. A. Wong, C. K. Quah, P. J. Srijana, and Pushparekha, "X-aggregation-induced emission in newly fabricated Pullulan/3-Hydroxyflavone derivative composite electrospun nanofiber mat for optical applications," *Journal of Molecular Structure*, vol. 1286, 135523, 2023, doi: 10.1016/j.molstruc.2023.135523.
- [2] B. S. Dayananda, B. K. Sarojini, Q. A. Wong, C. K. Quah, and P. J. Srijana, "J-aggregation-induced photoluminescence in electrospun pullulan/ 2-(2-fluorophenyl)-3-

hydroxy-4H-chromen-4-one composite mat for photonic applications,” *Optical Materials*, vol. 143, 2023, doi: 10.1016/j.optmat.2023.114303.

[3] L. Siama and A. Choudhury, “X-aggregates and their Influences on Solid-state Emission of Organoc Luminophores,” *Science & Technology Journal*, vol. 8, no. 2, pp. 55–61, 2020, doi: 10.22232/stj.2020.08.02.09.

[4] S. M. Dennison, J. Guharay, and P. K. Sengupta, “Excited-state intramolecular proton transfer (ESIPT) and charge transfer (CT) fluorescence probe for model membranes,” *Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy*, vol. 55, no. 5, pp. 1127–1132, 1999, doi: 10.1016/S1386-1425(99)00013-X.

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# FABRICATION AND CHARACTERIZATION OF TAMARIND SEED GUM BASED NOVEL HYDROGEL FOR THE TARGETED DELIVERY OF OMEPRAZOLE MAGNESIUM

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**Abstract:** The tamarind seed gum (TG) based novel hydrogel (TG-g-poly(AMPS)) was fabricated to use for the targeted delivery of omeprazole magnesium at stomach pH of 1.5. The free radical graft copolymerization of 2-acrylamido-2-methyl propane sulfonic acid (AMPS) with tamarind seed gum backbone resulted in hydrogel. In FT-IR spectrum the formation of sulfonic acid pendant groups in hydrogel was observed by the existence of an absorption band at  $1152\text{ cm}^{-1}$  for S=O group. The thermal stability decreased for the hydrogel due to its network structure. The amorphous hydrogel matrix converted to semicrystalline on incorporation of drug which was revealed by PXRD with peaks at  $2\theta=20.4^\circ$ ,  $31.5^\circ$  and  $52.2^\circ$ . In SEM images bigger voids present in the hydrogel which narrowed down for drug loaded matrix also supported by the presence of a peak for magnesium in the EDX. The greatest swelling was observed at pH 7 with 2<sup>nd</sup> order rate constant  $1.5371\text{ (g/g)/min}$ . The cumulative release of drug from hydrogel matrix was found to be 97.85% over 1200 minutes for encapsulated drug ( $70\pm 1\%$ ). The drug release transport was found combination of diffusion and erosion of polymer chain to be super case II diffusion ( $n=1.2296$ ) and Hill equation model ( $R^2=0.9821$ ) was good fit.

**Keywords:** Tamarind seed gum; Hydrogel; Targeted delivery; Omeprazole magnesium

## References

- [1] K. Bello, B. K. Sarojini, and B. Narayana, "Design and fabrication of environmentally benign cellulose based hydrogel matrix for selective adsorption of toxic dyes from industrial effluvia," *J. Polym. Res.*, vol. 26, no. 3, pp. 1–13, 2019.

- [2] N. Martinez-Vazquez, R. D. Antonio-Cruz, a Alvarez-Castillo, a M. Mendoza-Martinez, and a B. Morales-Cepeda, "Swelling kinetic of hydrogels from methyl cellulose and poly(acrylamide)," *Rev. Mex. Ing. Quim.*, vol. 6, no. 3, pp. 337–345, 2007.
- [3] S. Jha, R. Malviya, S. Fuloria, S. Sundram, and V. Subramaniyan, "Characterization of Microwave-Controlled Polyacrylamide Graft Copolymer of Tamarind Seed Polysaccharide," *Polymers (Basel)*., pp. 1–14, 2022.
- [4] K. Arun Krishna and B. Vishalakshi, "Gellan gum-based novel composite hydrogel: Evaluation as adsorbent for cationic dyes," *J. Appl. Polym. Sci.*, vol. 134, no. 47, pp. 1–9, 2017.

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## Multi-Functional Food Packaging Films: A New Era of Food Safety

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**Abstract** Active food packaging is popular because it can improve food product shelf life by adding functional ingredients. The quality and safety of perishable items depend on food packaging materials. This study investigated the creation of novel food packaging films with ZnO nanoparticles synthesized from golden apple leaf extract, dextrin, and tannic acid to achieve antimicrobial activity, UV protection, pH sensitivity, and extended shelf life. Dextrin, a starch biopolymer, and tannic acid, a natural polyphenol. We use dextrin, a polysaccharide derivative, since it forms films, regulates moisture, and sticks well. These traits protect the food product and manage moisture, reducing microbial growth. A tight connection to the food surface helps the film minimize microbial infiltration. Tannic acid inhibits microbial development, whereas dextrin makes the film flexible. Tannic acid, an organic polyphenol, is antimicrobial. When added to the film, tannic acid creates an unfavourable environment that prevents microbiological infection. Tannic acid and dextrin boost the film's antibacterial efficacy, reducing microbial infections. They form a strong, durable, and mechanically efficient film matrix. Dextrin and tannic acid were chosen as film-forming agents due to their biocompatibility, biodegradability, and film-forming properties. This multipurpose film protects against microbial threats and physically blocks contaminants. Thus, packaged food safety and shelf life are greatly improved. Using dextrin and tannic acid in film manufacture reduces microbial contamination in food packaging, a major food industry issue. With an emphasis on avoiding dangerous reactants and byproducts, it successfully manufactured zinc oxide nanoparticles (ZnO NPs) using a golden apple leaf extract in water. ZnO nanoparticles UV-blocking properties protect food from harmful UV radiation and extend shelf life. Added pH-sensitive dyes to the film provide real-time food quality monitoring, notifying consumers of spoilage or contamination. This new approach solves food preservation difficulties such as antimicrobial protection, UV shielding, pH sensitivity, and increased shelf life, improving food safety and quality.



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## Influence of co-dopants like Bi/Se on SnTe polycrystal synthesized by using Solid-State Reaction method.

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**Abstract:** A sustainable solution to the energy crisis may be found in thermoelectric materials and generators, which can convert thermal energy into electrical energy or vice versa. SnTe is one of the emerging thermoelectric materials with distinctive properties. The main advantage of this compound is, it is composed of earth-abounded, inexpensive, non-toxic elements and it is also known for its high thermoelectric performance. Here we prepared Bi/Se co-doped SnTe polycrystals whereas Bi is added to the Sn site and Se is added to the Te site with different compositions such as ( $x=0.0,0.02,0.04,0.06$  and  $y=0.03$ ) in ( $\text{Bi}_x\text{Sn}_{1-x}\text{Te}_{1-y}\text{Se}_y$ ) matrix by using the solid-state reaction method. The prepared samples were studied by different analytical techniques. X-ray diffraction (XRD) study indicates SnTe and doped SnTe samples are in their pure phase. The XRD patterns are fitted with the Rietveld refinement. The peak corresponding to the plane (200) has been observed to be the highest-oriented phase in all the samples. XRD data confirms the samples belong to the cubic crystal system with the  $\text{fm}3\text{m}$  space group and also we calculated the crystallite size and strain generated in the samples. Field Emission Scanning Electron Microscopy (FESEM) analysis shows the surface morphology of synthesized samples and how it altered after adding dopants is studied. Energy Dispersive Analysis of X-ray (EDAX) data from different regions of the synthesized sample confirms the presence of elements and the homogeneous distribution of elements throughout the sample. The thermoelectric properties of the synthesized samples were studied.

**Keywords:** Tin chalcogenides, structural and morphological studies.

### References:

1. L. Wang *et al.*, "Thermoelectric Performance of Se/Cd Codoped SnTe via Microwave Solvothermal Method," *ACS Appl Mater Interfaces*, vol. 9, no. 27, pp. 22612–22619, 2017, doi: 10.1021/acsami.7b06083.

2.R. Gupta, N. Kumar, P. Kaur, and C. Bera, "Theoretical model for predicting thermoelectric properties of tin chalcogenides," *Physical Chemistry Chemical Physics*, vol. 22, no. 34, pp. 18989–19008, 2020, doi: 10.1039/d0cp03117h.

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## Impact of Sputtering Power on Growth of Piezoelectric AlN Thin-Films

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**Abstract:** Complementary Metal Oxide Semiconductor (CMOS) compatible Aluminum Nitride is a promising piezoelectric material for a wide range of piezoelectric applications from energy harvesters to biosensors. The growth and fabrication of device-quality thin films required for MEMS integration is more important and quite complex. Sputtering power greatly influences the deposition rate, crystalline quality, surface morphology, and piezoelectric properties of the grown films. In this work, AlN is deposited using reactive magnetron sputtering at a sputtering temperature of 300 °C. Our focus was to study the effect of sputtering power on c-axis orientation of AlN thin films. We have varied Al sputtering power from 100 W to 175 W in the step of 25 W. X-ray diffraction and Atomic Force Microscopy techniques were used to characterize the structural and surface topography of deposited thin films. XRD studies have shown that films grown at 175 W show a highly c-axis orientation (002) plane with an FWHM value of 0.34°. The roughness of all the films was found to be less than 3 nm. The analysis has shown that the phase pure films can be used for device applications.

**Keywords:** AlN; Piezoelectricity; MEMS; Magnetron Sputtering

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## Structural and optical characterization of Sr-doped NiO thin films by spray pyrolysis technique

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**Abstract:** NiO thin film is a widely studied optoelectronic material at present. Doping is an important method to adjust its structural, optical, electrical and magnetic properties. Many doped NiO thin films, especially those doped with Al, Zn, Co have been extensively investigated. However, the Sr-doped NiO thin films have been relatively underreported until now. This work involves studies on some structural and optical properties of Sr-doped NiO thin films at various wt% of Sr (0 to 4wt %) prepared on glass substrate by spray pyrolysis technique. The structural and optical properties are analyzed using X-ray diffraction (XRD), FTIR, Raman and UV visible spectroscopy, respectively. The XRD patterns indicate that all films possess a polycrystalline cubic structure with (111) and (200) orientation. The crystallinity and crystallite size decrease as dopant concentration increases. The FTIR analysis shows the absorption bands at 385 and 650 cm<sup>-1</sup>, related to Nickel defects and surface oxygen interstitials. Raman spectra exhibit peaks at 360 and 480 cm<sup>-1</sup> and are ascribed to the first order phonon modes of vibrations of Ni-O. The optical analysis shows that transmittance increases up to 60% as dopant percentage increases to 6wt %. The optical band gap value, calculated from Tauc's relation, is found to be 2.94, 3.01, 3.02 and 2.96 eV for Pure, 2, 4 and 6wt% Sr doped NiO films, respectively.

**Keywords:** Spray pyrolysis, NiO, XRD, FTIR, Raman

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## Structural and optical characterization of Sr-doped NiO thin films by spray pyrolysis technique

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**Abstract:** NiO thin film is a widely studied optoelectronic material at present. Doping is an important method to adjust its structural, optical, electrical and magnetic properties. Many doped NiO thin films, especially those doped with Al, Zn, Co have been extensively investigated. However, the Sr-doped NiO thin films have been relatively underreported until now. This work involves studies on some structural and optical properties of Sr-doped NiO thin films at various wt% of Sr (0 to 4wt %) prepared on glass substrate by spray pyrolysis technique. The structural and optical properties are analyzed using X-ray diffraction (XRD), FTIR, Raman and UV visible spectroscopy, respectively. The XRD patterns indicate that all films possess a polycrystalline cubic structure with (111) and (200) orientation. The crystallinity and crystallite size decrease as dopant concentration increases. The FTIR analysis shows the absorption bands at 385 and 650 cm<sup>-1</sup>, related to Nickel defects and surface oxygen interstitials. Raman spectra exhibit peaks at 360 and 480 cm<sup>-1</sup> and are ascribed to the first order phonon modes of vibrations of Ni-O. The optical analysis shows that transmittance increases up to 60% as dopant percentage increases to 6wt %. The optical band gap value, calculated from Tauc's relation, is found to be 2.94, 3.01, 3.02 and 2.96 eV for Pure, 2, 4 and 6wt% Sr doped NiO films, respectively.

**Keywords:** Spray pyrolysis, NiO, XRD, FTIR, Raman

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## (Co,Ni) co-doped ZnO nanoparticles for rapid photocatalytic degradation of dual dyes

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**Abstract:** In this study, Co-Ni co-doped ZnO nanoparticles were synthesized by combustion method. X-ray diffraction analysis conveyed crystalline nature and wurtzite structure of ZnO. UV-vis DRS studies affirmed red shift in the band gap of co-doped sample. PL spectrum analysis elucidated the presence of various defects in the ZnO lattice. Photocatalytic performance of photocatalysts was examined by the degradation of methylene blue (MB) and rhodamine B (RhB) dyes under sunlight irradiation. Co-doping results in a better charge separation with suppression in electron hole recombination and improved visible light absorption. Co and Ni co-doped ZnO nanoparticles showed superior photocatalytic activity for dye degradation with a higher rate constant.

**Keywords:** ZnO; co-doped; dyes; photocatalytic activity

### References

1. A.A. Azab, E. Ateia, S.A. Esmail, Comparative study on the physical properties of transition metal doped ZnO nanoparticles, Appl. Phys. A. 124 (2018) 469.
2. S.B. Rana, R.P.P. Singh, Investigation of structural, optical, magnetic properties and antibacterial activity of Ni doped zinc oxide nanoparticles, J Mater Sci: Mater Electron. 27 (2016) 9346-9355.
3. A. Mondal, N. Giri, S. Sarkar, S. Majumdar, R. Ray, Tuning the photocatalytic activity of ZnO by TM doping, Mater. Sci. Semicond. 91 (2019) 333-340.
4. S. Anitha, S. Muthukumaran, Microstructure, crystallographic and photoluminescence examination of Ni doped ZnO nanoparticles co-doped with Co by sol-gel method, J Mater Sci: Mater Electron. 28 (2017) 12995-13005.

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## Synthesis of Graphene Oxide and Reduced Graphene Oxide Using Hummer's Method and its Applications.

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**Abstract:** The aim is to study the influence of different solvents on the structure and electrical properties of graphene oxide. Graphene Oxide (GO) was obtained from graphite flakes by using Hummer's method. GO with ascorbic acid which resulted in the formation of a high surface area of the two-dimensional structure consisting of Reduced Graphene Oxide (RGO) flakes and nanosheets. To obtain the porous and layered structure of RGO, hydrothermal reduction was performed at an elevated temperature. The synthesized GO and reduced GO were characterized by X-ray diffraction (XRD), Fourier transform infrared (FTIR), Ultra visible (UV) and Scanning Electron Microscope (SEM) to investigate the morphological and physicochemical changes that occurred in exfoliated graphite. In XRD results, it was found that (111) at  $2\theta = 10.21^\circ$  peak with an interplanar spacing of 8.6nm of graphite powder disappeared, while another significant peak observed at  $2\theta = 20.89^\circ$  with an interplanar spacing of 0.4.25 nm demonstrated successful oxidation of graphite and formation of GO. A diffraction peak obtained at  $2\theta = 26.89^\circ$  indicated that upon hydrothermal reduction, reduced GO flakes were formed. SEM results also support the formation of RGO since particle size lies in the nanometric range (6-20 nm) and its applications.

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## Gamma radiation-induced modification in Mechanical Properties of Hybrid Polymer Nanocomposites

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**Abstract:** A hybrid polymer nanocomposite was created using Polyvinyl Alcohol (PVA), glutaraldehyde (GA), Silver (Ag), and Graphene Oxide (GO) nanoparticles (NPs) through a straightforward in situ chemical reduction process. These prepared samples underwent gamma radiation at varying doses, ranging from 0 to 10 kGy, to investigate alterations in their structural and mechanical properties. To validate the elemental composition and functional groups present in both unirradiated and irradiated nanocomposites, EDX and FTIR spectra were employed. The investigation also extended to the mechanical characteristics of these samples. In unirradiated samples, elongation at break was determined to be  $134.67 \pm 1.45$  %, while radiation exposure resulted in an increase in the elongation at break to  $175.33 \pm 8.01$  %. Tensile strength initially declined for the 2 kGy exposure but increased at 5 kGy, only to decrease again with further dose increments. Remarkably, the material exhibited increased toughness as the dose reached 5 kGy, with a measured value of toughness at  $55.30 \pm 6.09$  MJ/m<sup>3</sup>. These findings shed light on the impact of gamma radiation on the structural and mechanical properties of the nanocomposite material.

**Keywords:** Hybrid nanocomposites, radiation effects, structural, and mechanical properties.

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## Effect of molar concentration and annealing temperature on structural and optical properties of SnO<sub>2</sub> thin films

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**Abstract:** In this work, firstly we prepared SnO<sub>2</sub> thin films with various molar concentrations (0.2M, 0.4M, 0.8M, and 1M) and with various annealing temperatures (300 0C, 400 0C, 500 0C, and 600 0C) on glass substrate using sol-gel spin coating method. Then we investigated the effect of molar concentration and annealing temperature on the structural and optical properties of SnO<sub>2</sub> thin films using X-ray diffraction (XRD), UV-Vis spectroscopy, FTIR, and Raman spectroscopy. XRD analysis reveal that SnO<sub>2</sub> thin films exhibited tetragonal polycrystalline with a growth orientation along the (1 1 0) plane. In order to understand the effect of molar concentration and annealing temperature on structure properties, Structure parameters such as crystallite size, lattice constants, cell volume, microstrain, and dislocation density were estimated. As increasing molar concentration and annealing temperature, crystallite size enhanced from 4.20nm to 6.61nm and 3.56nm to 4.21nm respectively. The film prepared at 1M precursor concentration and also film annealed at 600 0C show the least dislocation densities 2.28x10<sup>16</sup> lines/m<sup>2</sup> and 5.64x10<sup>16</sup> lines/m<sup>2</sup>, respectively. Transmittance spectra show that with increasing molar concentration up to 1M, transmittance reduced from 90 to 50%. But for increased annealing temperature, transmittance gradually increased from 75 to 90%. Also, as the absorption edge shifted toward longer wavelengths, band gap energy decreased from 3.94 to 3.08 eV with increasing molar concentration, similarly, it decreased from 3.89 to 3.82eV with increasing annealing temperature.

**Keywords:** Spin coating; SEM; XRD; FT-IR; Raman spectroscopy; optical properties



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## Optical and Structural Properties of TiO<sub>2</sub> doped Lithium borate glasses

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**Abstract:** The new glasses were prepared by melt quenching, and the glass composition  $x\text{TiO}_2$ - $(50-x)\text{Li}_2\text{O}$ - $50\text{B}_2\text{O}_3$ , where  $x = 0, 1, 3, 5, 7,$  and  $9$  in mol%, was characterized using XRD spectra that showed no sharp peaks, confirming the amorphous nature of the prepared glass samples. The density of the prepared glasses was determined using the Archimedes principle and the associated molar volume. As expected, density increases with increasing mol% TiO<sub>2</sub>, but molar volume falls with increasing TiO<sub>2</sub> concentration. A UV-visible spectrometer was used to record the absorption spectra, which ranged from 200 nm to 1100 nm. The Taucs plot was used to evaluate the direct and indirect energy band gaps, and the fluctuation of the energy band gap with mol% TiO<sub>2</sub> was discussed. The refractive index was estimated using energy band gap values as well. The functional groups were found using Fourier infrared spectra with wave numbers ranging from 1000 to 4000 per centimeter.

**Keywords:** Borate glass, Density, energy band gap, and Spectroscopy (Raman, FT-IR and UV-Visible).

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## Zinc Salt Doped Biodegradable Polymer: Creating a Sustainable Solid Polymer Electrolyte

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**Abstract:** Zinc-ion batteries offer cost-efficiency, safety, and scalability due to abundant and affordable zinc. Their stable, environmentally friendly nature, improved energy density, and potential for large-scale energy storage make them ideal for diverse applications[1]. Furthermore, biodegradable solid polymer electrolytes are crucial for eco-friendly energy storage. These materials enable safer, more sustainable batteries by replacing conventional liquid electrolytes, reducing leakage risks and enhancing battery stability. Their biodegradability ensures minimal environmental impact. Solid polymer electrolytes also offer the potential for flexible, lightweight, and safer battery designs in various devices.[2] Chitosan is an abundant biodegradable material derived from chitin, a polymer from the shells of crustaceans[3]. Zinc acetate is proposed as a suitable binder and a cross-linker for initiating and maintaining ion transport[4]. The polymer is doped with the zinc salt with an absolute weight percentage of the total weight. The mixture is solution cast and dried to obtain the polymer films, and its doping effect is validated through XRD. Its conductivity is calculated with the aid of impedance spectroscopy. The Electrochemical Stability Window (ESW) is measured to explore its potential application in an energy storage device and found to be about 2.7 V. Furthermore, chronoamperometry is used to elucidate the ion transference number (t<sub>ion</sub>) of the polymer electrolyte and is found to be about 0.94.

**Keywords:** Solid Polymer Electrolyte; Zinc-ion; Zinc-based batteries

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## Iron doping for enhancing the electrochemical performance of NiCo<sub>2</sub>S<sub>4</sub> for the supercapacitor electrode

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**Abstract:** There is a need for clean energy sources because of the depletion of fossil fuels and the exponential rise in energy demand. The development of appropriate electrochemical energy conversion and storage technologies is essential for an environmentally friendly and sustainable civilization. Supercapacitors are being investigated as possible renewable energy storage technologies and are becoming more important in the current world. Therefore, it is crucial to provide an electrode material for supercapacitors that is broadly accessible, economically priced, has superior structure, good performance, and is environmentally friendly. Herein, we provide a one-step hydrothermal approach for the synthesis of NiCo<sub>2</sub>S<sub>4</sub> nanomaterial and probe the effect of FeCl<sub>3</sub> on the electrochemical performance of NiCo<sub>2</sub>S<sub>4</sub>. X-ray diffraction (XRD), Field emission scanning electron microscopy (FESEM), and Raman analysis were used to characterize the synthesized materials. The electrochemical properties of Fe-doped NiCo<sub>2</sub>S<sub>4</sub> were evaluated using cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS) and discovered to have specific capacitance values of 176 Fg<sup>-1</sup> at 5 mVs<sup>-1</sup> and 138 Fg<sup>-1</sup> at 0.5 Ag<sup>-1</sup>. Additionally, this material's stability has been examined over the course of 1000 cycles, and it was discovered that after 1000 cycles, 98% of the capacitance was retained. The acquired results shed light on the functions of metal doping in NiCo<sub>2</sub>S<sub>4</sub>, which could be helpful for the material's future advancement in supercapacitor applications.

**Keywords:** Supercapacitor, Hydrothermal method, Nanomaterial, Fe doped NiCo<sub>2</sub>S<sub>4</sub>

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## Synthesis and Catalytic Evaluation of Ag-Co Bimetallic Nanoparticles for P-Nitrophenol Degradation

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**Abstract:** Bimetallic nanomaterials have gained prominence in recent years for their catalytic efficiency in various environmental and industrial applications. The present work aims at the synthesis, characterization, and catalytic performance of Ag-Co bimetallic nanoparticles. The nanoparticles were synthesized using a chemical reduction method and were characterized using UV-Visible spectroscopy, Scanning Electron Microscopy (SEM) and X-ray diffraction (XRD) methods. These analyses provided insights into the optical and structural properties of the nanoparticles. The heart of this study lies in the evaluation of these nanoparticles as catalysts for the degradation of P-nitrophenol dye, a model pollutant. A UV-visible spectrometer was employed to monitor the catalytic degradation and it was observed that the Ag-Co bimetallic nanoparticles completely degraded P- Nitrophenol within 10 minutes. The spectral absorbance study confirmed the efficacy of the catalyst.

**Keywords:** Bimetallic; Catalytic Activity; P-nitrophenol

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## Studies on guar gum and cellulose acetate superabsorbent hydrogel beads with high water retention properties for rejuvenation of dryland wettability

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**Abstract:** The guar gum-polyethylene glycol (GG-PEG) and cellulose acetate-polyethylene glycol (CA-PEG) hydrogel beads were synthesized using crosslinking agent polyethylene glycol with drop cast method. The newly fabricated beads were characterized by FTIR, FESEM, TGA and swelling studies. Both, the hydrogel beads were subjected for their water retention, water holding and soil porosity studies. It was found that the swelling ratio for GG-PEG was found to be 350 g/g and that of CA-PEG was found to be 250 g/g. The water retention capacity of GG-PEG was 20% more than that of the untreated soil while in CA-PEG, it increased to 17.5% even at high pressures. The water-holding capacity of the soil when treated with GG-PEG increased to 16.05% while in CA-PEG, it was 9.69%. The porosity of soil increased to 69.45% in the case of GG-PEG hydrogel beads and 65.17% in the case of CA-PEG when compared to untreated soil. The biodegradable studies of the hydrogel beads showed that GG-PEG was more susceptible to degradability since it was a natural polymer. Hence, GG-PEG was more efficient than that of CA-PEG and this study proves that natural polymers can be used as superabsorbents to improve the soil properties by acting as soil conditioners.

**Keywords:** guar gum, cellulose acetate, superabsorbent, water retention, hydrogel beads

### References

1. Thombare, N.; Mishra, S.; Siddiqui, M. Z.; Jha, U.; Singh, D.; Mahajan, G. R. Design and Development of Guar Gum Based Novel, Superabsorbent and Moisture Retaining Hydrogels for Agricultural Applications. *Carbohydr. Polym.* **2018**. <https://doi.org/10.1016/j.carbpol.2018.01.018>.
2. Wang, W.; Wang, A. Preparation, Swelling and Water-Retention Properties of Crosslinked Superabsorbent Hydrogels Based on Guar Gum. *Adv. Mater. Res.* **2010**, *96*, 177–182. <https://doi.org/10.4028/www.scientific.net/AMR.96.177>.

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## Synthesis and structural characterization of Fluconazole - 2-chloro-5-nitro benzoic acid cocrystal

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**Abstract:** Crystal engineering involved the study of intermolecular interactions that govern the crystal packing so that new solid forms could be designed with improved physicochemical properties. Hydrogen bonding is a paradigm of supramolecular chemistry and found to be significant in the crystallization of multicomponent solids through a supramolecular synthonic approach. Over the past few decades, pharmaceutical cocrystals have become a viable alternative for synthesizing enhanced crystalline forms of active pharmaceutical ingredients (API). Here, the cocrystal of fluconazole (FLU) with 2-chloro-5-nitro benzoic acid (CNB) was investigated. The newly formed cocrystal (FLUCNB) has been thoroughly investigated by different analytical techniques, including powder and single crystal X-ray diffractometry (XRD), FTIR, and Hirshfeld surfaces analysis. The asymmetric unit of cocrystal comprised one molecule of FLU and CNB each. The strong O—H···N hydrogen bonding was considered as the key interaction in stabilizing the supramolecular assemblage of FLUCNB. Molecular structure was held together by both classical hydrogen bondings and nonclassical interactions creating various motifs like [Equation](14), and [Equation](11). From Hirshfeld surfaces analysis, it was noteworthy that the variation in the percentage contribution of O···H (21.5 %) and N···H (12.5 %) interconnects signify the importance of O—H···N intercontacts in stabilizing the crystal packing.

**Keywords:** Fluconazole; 2-chloro-5-nitro benzoic acid; cocrystal; hydrogen bonding; Hirshfeld surfaces analysis

### References

1. Desiraju G.R., Crystal engineering: From molecule to crystal, *J. Am. Chem. Soc.*, 2013 135, 9952–9967. <https://doi.org/10.1021/ja403264c>.

2. Desiraju G.R., The Supramolecular Synthon in Crystal Engineering, *Stimul. Concepts Chem.*, 2005, 293–306. <https://doi.org/10.1002/3527605746.ch19>.

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## Synthesis and Thermoluminescence Studies of Sm<sup>3+</sup> Doped Bi<sub>2</sub>O<sub>3</sub> Nanophosphors

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**Abstract:** The current work involves the synthesis, characterization and thermoluminescence studies of Sm<sup>3+</sup> (7 mol %) doped Bi<sub>2</sub>O<sub>3</sub> nanophosphors (NPs) by solution combustion method. The average particle size was determined using Powder X-ray diffraction (PXRD) analysis and found to be in the range 13-30 nm. Thermoluminescence (TL) characteristics of β-rayed Bi<sub>2</sub>O<sub>3</sub>: Sm<sup>3+</sup> doped samples for dose of 1 Gy to 20 Gy are studied. The glow curve clearly shows two well resolved and separated glows with peaks ~ 165 °C (T<sub>g1</sub>) and 263 °C (T<sub>g2</sub>). The glow peak temperature of T<sub>g1</sub> and T<sub>g2</sub> are almost stable for the entire dose range with increase of beta ray dose. The peak intensity increases up to 10 Gy and then decreases due to thermal quenching. The peak around 165 °C is due to recombination of charges released from F<sup>+</sup> center near Bi<sup>3+</sup>/Sm<sup>3+</sup> sites and peak around 265 °C may be ascribed to recombination of F center electrons with holes associated with Bi<sup>3+</sup>/Sm<sup>3+</sup> sites. From the plot, the Activation energy and Frequency factors are found and these values are in good agreement with those values calculated by peak shape methods which are discussed in detail.

**Keywords:** Bi<sub>2</sub>O<sub>3</sub>:Sm<sup>3+</sup>; Thermoluminescence; Activation energy; Frequency factors

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### References :

- [1] N. Suriyamurthy, B. Panigrahi, "Effects of non-stoichiometry and substitution on photoluminescence and afterglow luminescence of Sr<sub>4</sub>Al<sub>14</sub>O<sub>25</sub>: Eu<sup>2+</sup>, Dy<sup>3+</sup> phosphor", J. Lumin., 128 (2008) 1809-1814.
- [2] E. Yukihara, R. Gaza, S. McKeever, C. Soares, "Optically stimulated luminescence and thermoluminescence efficiencies for high-energy heavy charged particle irradiation in Al<sub>2</sub>O<sub>3</sub>: C", Radiat. Meas., 38 (2004) 59-70.
- [3] N. Salah, P. Sahare, "The influence of high-energy 7Li ions on the TL response and glow curve structure of CaSO<sub>4</sub>: Dy", J. Phys. D: Appl. Phys., 39 (2006) 2684.



[4] V. Singh, T.G. Rao, J.J. Zhu, "Synthesis, photoluminescence, thermoluminescence and electron spin resonance investigations of  $\text{CaAl}_{12}\text{O}_{19}:\text{Eu}$  phosphor", *J. Lumin.*, 126 (2007) 1-6.

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## GEL COMBUSTION SYNTHESIS OF $\text{SrCeO}_3$ PEROVSKITES BY TAILORING THE INTERMEDIATE FUEL: A SPECTROSCOPIC STUDY

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**Abstract:** Strontium cerate perovskite ( $\text{SrCeO}_3$ ) was successfully synthesized through gel combustion method by varying the intermediate fuel (citric acid, sucrose, urea) of the combustion reaction. As synthesized powder samples were characterized using Rigaku SmartLab X-ray diffractometer and PL Fluorolog spectrometer with xenon lamp source for structural and photoluminescence analysis respectively. Further, the vibrational mode analysis of the samples was undergone using the Horiba scientific Raman microscopy technique. X-ray diffraction profile confirmed the orthorhombic structure of  $\text{SrCeO}_3$  with prominent crystalline behavior. Photoluminescence characteristics anticipated that the sample synthesized using citric acid as fuel could competently replace the other fuels, specifically sucrose and urea to attain greater photoluminescence properties. Even though the PL intensities using various fuels vary, all the  $\text{SrCeO}_3$  perovskites synthesized exhibit blue emission behavior, which was confirmed using CIE 1931 Chromaticity diagram. The above perovskite synthesized using citric acid as fuel acts as an efficient blue phosphor, which can be an unavoidable applicant for white light-emitting devices and applications.

**Keywords:** Strontium cerate; photoluminescence; fuel

### References

- [1] D. Yadav, U. Kumar, and S. Upadhyay, "Study of structural, electrical, and photoluminescent properties of  $\text{SrCeO}_3$  and  $\text{Sr}_2\text{CeO}_4$ ," *Journal of Advanced Ceramics*, vol. 8, no. 3, pp. 377–388, Sep. 2019, doi: 10.1007/s40145-019-0320-x.
- [2] D. Yadav, G. Nirala, S. Yadav, U. Kumar, S. Upadhyay, and S. Kumar, "Study of structural, microstructure, impedance, and DC conductivity of Gd-doped

SrCeO<sub>3</sub> ceramics,” *Appl Phys A Mater Sci Process*, vol. 127, no. 12, Dec. 2021, doi: 10.1007/s00339-021-05112-5.

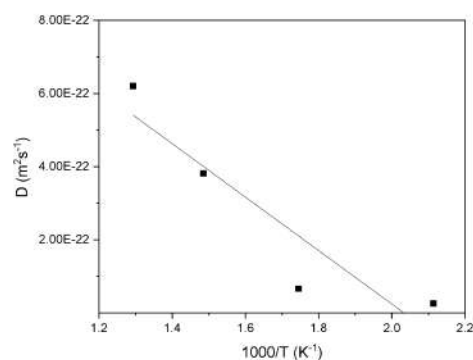
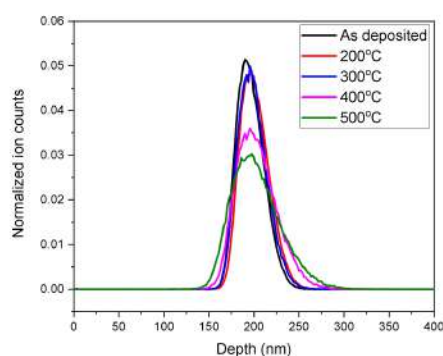
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## DIFFUSION OF YTRIUM IN IRON STUDIED BY SECONDARY ION MASS SPECTROMETRY

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**Abstract:** Oxide dispersion strengthened alloys (ODS) is an advanced class of structural alloy to be used in sodium cooled fast reactors and fusion reactors [1]. These alloys are based on nanoscale Y-Ti-O dispersoids in steel matrix. It is important to understand the diffusion of the constituent elements in the matrix as it plays a crucial role in formation and stability of these alloys in radiation environment. Specific interest has been shown in the study of diffusion of yttrium in iron matrix, as yttrium is the least mobile of all hence limiting the kinetics. There are some reported values of yttrium diffusion parameters in iron matrix [2] calculated by different modelling approach, however, there is no experimentally determined values to our knowledge. We have designed an experiment based on a sandwich thin film geometry of Fe/Y/Fe. Fe/Y thin films were sputter deposited on  $\alpha$ -Fe substrate and post annealed at temperatures from 200°C to 500°C.



*Elemental distribution of Y at different annealing temperatures and plot of diffusivity of yttrium as a function of inverse temperature*

We took the advantage of Secondary Ion Mass Spectrometry (SIMS) to study the diffusion which is capable of measuring the elemental distribution with nanometer resolution. Diffusivity

was determined at different temperatures from the broadening of yttrium distribution profile given in figure 1. The activation energy was determined from the Arrhenius plot of temperature dependent diffusivity as shown in figure 2.

**Keywords:** Secondary Ion Mass Spectrometry; Diffusion; sputter deposition; thin film

*References*

1. G.R. Odette, M.J. Alinger, B.D. Wirth, Annual Review of Materials Research 2008 38:1, 471-503 and references there in
2. M. Mock, K Albe, J. Nuclear Materials 494 (2017) 157-164 and references there in.

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## 8MeV ELECTRON IRRADIATION EFFECTS ON STRUCTURAL AND OPTICAL PROPERTIES OF POLYMER ELECTROLYTES

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**Abstract:** This paper describes the effect of 8MeV electron beam (EB) irradiation on structural and optical properties of doped polyethylene oxide (PEO) films. The films were exposed to 8MeV EB irradiation with various doses in free environment. The X-ray diffraction (XRD), Fourier Transform Infrared (FTIR), Scanning Electronic Microscope (SEM) and Ultraviolet-Visible (UV-Vis.) techniques were employed to know changes in structural phase, chemical interaction, surface morphology and optical properties of films before and after irradiation. From the UV-Vis. results it is examined that the absorption edges shifts towards longer wavelength side from 5.84-5.64eV (212-219nm) with doses. The optical band gaps ( $E_g$ ) values are found to be decreases from 5.90-5.51eV and 5.55-5.05eV with increasing the dose represent to the allowed electron transition. The number of carbon atoms in cluster is correlated through optical energy band gaps ( $E_g$ ) which are determined using modified Tauc's equation and they found number of carbon atom increases with dose. This study provide details of the electronic band structures, localized states and optical dispersion and these materials properties placed to use various applications.

**Key words:** Polymer electrolyte, Electron beam irradiation, FTIR, Optical Band gap, Carbon clusters.

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## Thermal and Electrical Conductivity PVA-SA/Ag Nanocomposite Thin Films

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**Abstract:** The Polyvinyl alcohol (PVA), PVA-Sodium-alginate (SA), PVA-Ag, and PVA-SA/Ag nanocomposite thin films were successfully synthesized by the "one-pot synthesis" method. Characterizations of the prepared films were carried out using UV, FTIR, and XRD. PVA absorbance peak is observed at 276.56 nm. PVA/Ag SPR peak is at 438.64 nm. When Sodium Alginate is added to PVA/Ag, peak shift to 388.12 nm and narrow peak is observed. The energy band gap (Eg) of PVA-Ag for direct allowed transition is 3.6732 eV, and for indirect allowed transition, it is 2.858 eV, as confirmed by UV-Visible spectra analysis. The electrical conductivity of PVA is  $0.12980 \times 10^{-6} \Omega^{-1}m^{-1}$ . The conductivity increases to  $0.06750 \times 10^{-6} \Omega^{-1}m^{-1}$  upon adding Ag, and it further increases to  $0.04476 \times 10^{-6} \Omega^{-1}m^{-1}$  when SA is added to PVA/Ag. PVA is reported to have a thermal conductivity of 0.252 W/mK. When Ag is added, the thermal conductivity rises to 0.264 W/mK, and when SA is added, the thermal conductivity increases even more to 0.424 W/mK. In summary, the synthesized PVA-SA/Ag films show good thermal and electrical conductivity. These composites seem to be potential candidates for conductive coating applications, such as flexible electronics, printed circuits, and sensors where enhanced electrical conductivity is required. They are also suitable for thermally conductive adhesives for applications like bonding heat-sensitive electronic components, providing efficient heat dissipation while maintaining electrical conductivity.

**Keywords:** Nanoparticles, Polyvinyl alcohol, Sodium-alginate, Electrical Properties, Thermal Properties, Nanocomposite

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## Pectin wrapped halloysite nanotube reinforced Polycaprolactone films for potential wound healing application

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**Abstract:** The current research work focuses on preparing the polycaprolactone (PCL) based nanocomposite films embedded with surface modified Halloysite Nanotube (HNT). The avenue of the study is to unravel the applicability of polymer nanocomposites for wound healing. Extremely flexible property of HNT was taken as the major force to accomplish the addition of biopolymer pectin onto its surface. Functionalization of HNT with pectin has certainly enhanced its binding nature with the polymer. The PCL nanocomposite films were characterised by several promising techniques such as FTIR, XRD, DSC-TGA, FESEM, AFM, and mechanical properties were too examined along. When compared to the plane PCL film, the nanocomposite films manifested favourable results in terms of mechanical and chemical properties. Additionally, biometric studies such as enzymatic degradation, hemolysis performed on the films gave extremely good results. The haemolytic percentage recorded for the films exhibited a steady decrease with increasing amount of nanofillers. The MTT assay showed cell proliferation and its increase as the embedded HNT is more in the matrix. Wound closure study performed on NIH3T3 cell line with 1, 3 and 5wt% of films has given a strong proof for the involvement of polymer and HNT in the healing procedure.

**Keywords:** wound healing; cell migration; polycaprolactone; tissue regeneration.

### References

- [1] H. Donya, R. Darwesh, and M. K. Ahmed, "Morphological features and mechanical properties of nanofibers scaffolds of polylactic acid modified with hydroxyapatite/CdSe for wound healing applications," *Int. J. Biol. Macromol.*, vol. 186, no. April, pp. 897–908, 2021, doi: 10.1016/j.ijbiomac.2021.07.073.
- [2] S. S. D. Kumar, N. K. Rajendran, N. N. Houreld, and H. Abrahamse, "Recent advances on silver nanoparticle and biopolymer-based biomaterials for wound healing applications," *Int. J. Biol. Macromol.*, vol. 115, no. 2017, pp. 165–175, 2018, doi: 10.1016/j.ijbiomac.2018.04.003.

- [3] A. Ali and S. Ahmed, "A review on chitosan and its nanocomposites in drug delivery," *Int. J. Biol. Macromol.*, vol. 109, pp. 273–286, 2018, doi: 10.1016/j.ijbiomac.2017.12.078.
- [4] P. Chandika, S. C. Ko, and W. K. Jung, "Marine-derived biological macromolecule-based biomaterials for wound healing and skin tissue regeneration," *Int. J. Biol. Macromol.*, vol. 77, pp. 24–35, 2015, doi: 10.1016/j.ijbiomac.2015.02.050.

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## RAPID GREEN SYNTHESIS OF SILVER NANOPARTICLES FOR MALATHION EXTRACTION FROM AQUEOUS SOLUTIONS

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**Abstract:** Malathion is an organophosphorus insecticide and one of the most prevalent pollutants in water, having harmful effects on human health. The use of plasmonic metal nanoparticles to adsorb insecticides from aqueous solutions is a promising area of contemporary research. However, the process of synthesizing nanoparticles through chemical methods results in hazardous by-products. Here we present an alternative approach for rapid production of silver nanoparticles using radiation-assisted green synthesis. Under UV-B irradiation, the aqueous leaf extract of *Ocimum sanctum* is employed as the reducing and capping agent with the silver nitrate solution. The generated spherical-shaped silver nanoparticles (AgNPs) were polycrystalline with a fcc structure, non-agglomerated, polydisperse with an average diameter of 65.9nm, and showed zeta potential of -13.1 mV. These AgNPs were effective in the removal of 1 ppm and 2 ppm of malathion from aqueous solutions, up to 76.8% and 88.3%, respectively. These findings imply that green synthesized silver nanoparticles aided by radiation are inexpensive, ecologically friendly, successful in extracting low concentrations of malathion from water, and can be implemented for water purification in laboratories.

**Keywords:** Radiation-assisted synthesis; Silver nanoparticles; Pesticide adsorption; Water purification.

### References

1. Brown, A.W.A. *Ecology of pesticides*, Wiley New York 1997
2. Savage, N.; Duncan, M.D.J.; Street, A.; Sustich, R. *Nanotechnology applications for clean water*. William Andrew Inc, Burlington 2009
3. Abhijit, K.; Sonali, D.; Basana, G.; Naveenkumar, P.; Govindaraj, G. Facile synthesis of novel magnesium oxide nanoparticles for pesticide sorption from water *Environmental science and pollution research* **2023**, 1-16.



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## The impact of additional oxidizer on photoluminescence property of $\text{BaCe}_{0.99}\text{Pr}_{0.01}\text{O}_3$ perovskite

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**Abstract:** Barium cerate doped with various rare earth elements has been examined as a high proton conductive oxide functioned between 400 °C to 600 °C, which is expected as an electrolyte of solid oxide fuel cells, hydrogen separation membranes, hydrogen gas sensors, etc. Recently, these perovskites were also employed as luminescent materials due to their excellent photon emission properties. In contrast to other materials doped with praseodymium, researchers have not exploited  $\text{BaCeO}_3: \text{Pr}^{3+}$  as a luminescent material. This present work aims to study the effect of extra oxidizer on the photoluminescence property of  $\text{BaCeO}_3: \text{Pr}^{3+}$  perovskite. Single phase perovskite structured  $\text{BaCeO}_3: \text{Pr}^{3+}$  were synthesized through combustion procedure followed by calcination at 950 °C in air atmosphere. Orthorhombic perovskite crystal configuration was ensured by XRD investigation. SEM analysis revealed a compact well-structured morphology with clearly defined grain boundaries and consistency. The  $\text{Pr}^{3+}$  incorporation was found to cause emission peaks situated at 439 nm, 529 nm, 573 nm, 594 nm and 615 nm due to  $^3\text{P}_2 \rightarrow ^3\text{H}_4$ ,  $^3\text{P}_1 \rightarrow ^3\text{H}_5$ ,  $^3\text{P}_2 \rightarrow ^3\text{H}_6$ ,  $^3\text{P}_1 \rightarrow ^3\text{H}_6$  and  $^3\text{P}_0 \rightarrow ^3\text{H}_6 / ^1\text{D}_2 \rightarrow ^3\text{H}_4$  transitions. The CIE color coordinate diagram was employed for the analysis of the emitted color to find out its potential for wLED applications. We successfully achieved a finely tuned cool white light emission with very low color purity (CP), a high Color Rendering Index (CRI), and a high Correlated Color Temperature (CCT).

### Keywords

Barium cerate; luminescence; praseodymium doping; phosphor; wLED

### References

1. Y. Jin, Y. Hu, L. Chen, Y. Fu, Z. Mu, T. Wang, J. Lin, Photoluminescence, reddish orange long persistent luminescence and photostimulated luminescence properties of praseodymium doped  $\text{CdGeO}_3$  phosphor, J Alloys Compd. 616 (2014) 159–165. <https://doi.org/10.1016/j.jallcom.2014.07.154>.

2. J.F. Basbus, A. Caneiro, L.V. Mogni, Increasing Conductivity in Proton Conductors BaCeO<sub>3-δ</sub> Doped with Pr, ECS Trans. 58 (2013) 173–181. <https://doi.org/10.1149/05802.0173ecst>.
3. Q. Liu, L. Xu, J. Meng, J. Meng, X. Liu, H. Zhang, Microscopic Mechanism Study of 4f Electrons' Positive Effect on the Enhanced Proton Conduction in a Pr-Doped BaCeO<sub>3</sub> Electrolyte, Journal of Physical Chemistry C. 124 (2020) 21232–21241. <https://doi.org/10.1021/acs.jpcc.0c05067>.
4. N. Li, P. Zhang, Z. Wang, Z. Wei, Z. Jiang, Y. Shang, M. Zhang, Q. Qiang, L. Zhao, W. Chen, Novel UV and X-ray irradiated white-emitting persistent luminescence and traps distribution of Ca<sub>5</sub>Ga<sub>6</sub>O<sub>14</sub>: Pr<sup>3+</sup> phosphors, J Alloys Compd. 858 (2021). <https://doi.org/10.1016/j.jallcom.2020.157719>.

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## Investigation of fatigue behaviour in calcium doped bismuth ferrite thin films

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**Abstract:** Bismuth ferrite, has been sought-after for its versatile room-temperature multiferroic properties, which has translated into decades of research. In the present work, we investigated the fatigue property of the Ca-doped bismuth ferrite thin films through repeated I-V characterisation. The motivation for Ca doping into bismuth ferrite arises from the need to control the oxygen vacancies. We observe that the doping of Ca ions can affect the structure of the cell due to which hybridisation between Fe- and O reduces. It was also observed that the increased amount of Ca ions can also negatively affect ferroelectric properties as the aliovalent nature of the dopants can also induce oxygen vacancies thereby greatly affecting the fatigue behaviour. We realise that 10% Ca doping provides the best balance between its aliovalent nature which helps in controlling the dual oxidation states of Fe and the oxygen vacancy and thereby promote resistive switching and better fatigue behaviour

**Keywords:** Bismuth ferrite, Density functional theory, multiferroic.

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## Microstructural investigations in Co-precipitation synthesized Lanthanum Zirconate

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**Abstract:** Materials that can withstand extreme temperatures are of persistent interest in the sustainable energy domain, as they allow for clean energy production by enhancing the process efficiency. Thermal barrier coatings (TBCs) are one such class of materials where the ceramic coatings safeguard the structural alloy components by insulating them from direct interaction with hot gases and bringing down the effective temperature experienced by them. In the quest for novel TBC materials that can withstand temperatures even up to 1500 °C, pyrochlore structured Lanthanum Zirconates (LZ) have been identified as a potentially interesting candidate[1], [2].

In the present study, the authors have made efforts to understand the influence of process parameters in co-precipitation method viz; pH, annealing time and temperature on the structure and morphology of the evolved phase. X-Ray Diffraction and Electron Microscopy tools were used to analyze the crystal structure, morphology, composition and crystallite size of LZ materials and the results are complemented with Raman spectroscopy. In addition, structure refinement through Rietveld analysis was also carried out to quantify the microstructural parameters. The major results and the conclusions drawn from our detailed analysis will be discussed in the conference presentation.

**Keywords:** Co-precipitation; Microstructure; Lanthanum Zirconate; Thermal Barrier Coating.

**References:**

[1] J. Sankar and S. Kumar\*, "Synthesis of Rare Earth Based Pyrochlore Structured (A<sub>2</sub>B<sub>2</sub>O<sub>7</sub>) Materials for Thermal Barrier Coatings (TBCs) - A Review," *Curr. Appl. Sci. Technol.*, pp. 601–617, Feb. 2021.

[2] R. Vassen, A. Stuke, and D. Stöver, "Recent Developments in the Field of Thermal Barrier Coatings," *J. Therm. Spray Technol.*, vol. 18, no. 2, pp. 181–186, Jun. 2009, doi: 10.1007/s11666-009-9312-7.

# THE EFFECT OF FUEL CONCENTRATION ON PROPERTIES OF COBALT SUBSTITUTED COPPER FERRITE

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**Abstract:** Fuel plays an important role in providing the energy required for self combustion, hence appropriate amount of fuel can effectively change the properties of ferrites. The present study highlights the effect of fuel concentration on the properties of cobalt substituted copper ferrites. Cobalt substituted copper ferrite ( $\text{Co}_{0.5}\text{Cu}_{0.5}\text{Fe}_2\text{O}_4$ ) samples were synthesized via sol-gel method using aloe vera extract as green fuel with 20 ml (low), 60 ml (moderate) & 100 ml (high) of fuel concentrations. The effect of aloe vera concentration on structural, morphological, vibrational and optical properties was studied using XRD, SEM, FTIR, and UV-Vis. DRS techniques. The XRD analysis confirms the phase formation. The average crystallite size was 18-20 nm. An agglomerated flaky morphology with irregular shape of particles was observed. The vibrational analysis shows the presence of two prominent bands in  $\sim 410\text{ cm}^{-1}$  and  $\sim 510\text{ cm}^{-1}$  due to Metal-Oxygen stretching at octahedral and tetrahedral sites, respectively. The optical energy band gap of the prepared samples lies between 1.3 - 1.6 eV and these results indicate their photocatalytic applications. From the obtained results, the fuel concentration can be optimized to moderate.

**Keywords:** Copper Ferrite, aloe vera extract, substituted ferrites, green synthesis.

## References

- [1] Krutika L. Routray, Sunirmal Saha, Dhruvananda Behera, *Green Synthesis Approach for Nano sized  $\text{CoFe}_2\text{O}_4$  through Aloe Vera Mediated Sol-gel Auto Combustion Method for High Frequency Devices*, Materials Chemistry and Physics **2018**, 224, 29-35. doi: 10.1016/j.matchemphys.2018.11.073.
- [2] Bincy Rose Vergis, Nagaraju Kottam, Samrat K , Sharath R , Hari Krishna R , B.M. Nagabhushana and Muktha H, *Evaluation of Antimicrobial Activity and Cytotoxic Effect on MCF-7 Cell Line of Combustion Derived  $\text{CuFe}_2\text{O}_4$  Nanomaterial Using Aloe-Vera Extract*, Current Nanomaterials, **2018**, 3(3),153-159. doi: 10.2174/2405461503666181116121843.

- [3] B.Gayathri Manju and P. Raji, *Synthesis and Magnetic properties of nano-sized  $Cu_{0.5}Ni_{0.5}Fe_2O_4$  via citrate and aloe vera A comparative study*, *Ceramics International* **2018**,44(7)7329-7333 , <https://doi.org/10.1016/j.ceramint.2018.01.201>.

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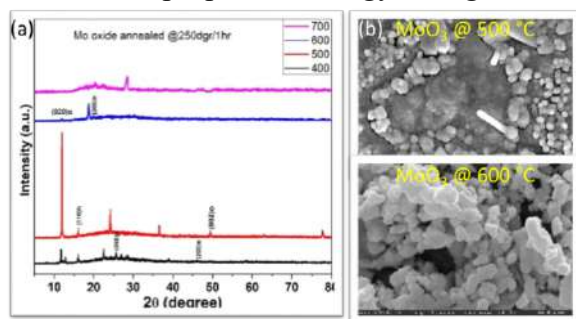
## Growth and Characterization of PVD Grown Molybdenum Oxide Thin Films

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**Abstract:** The limitation of fossil fuels as well as recent development of pollution free vehicles strongly demand an efficient energy storage device such as super capacitors and electric batteries. Molybdenum oxide is one of the most useful transition metal oxides which exhibits in several oxide stoichiometry among which trioxide and dioxide are commonly found. However, the high fuel flexibility of MoO<sub>2</sub> makes it suitable candidate as anode material for solid oxide fuel cells.

High purity Mo films are deposited on quartz substrates at room temperature using an electron beam evaporation technique ( $\sim 10^{-5}$  mbar) followed by controlled thermal oxidation in air ambient at various temperatures. Structural, morphological, chemical, and electrical properties of these oxide layers are investigated using various surface characterization techniques such as XRD, SEM, Raman spectroscopy, and XPS. As deposited Mo films appear in an amorphous phase, whereas vacuum annealing at 250°C drastically enhances the crystalline quality. FESEM imaging shows uniform film with small granular morphology. XRD and Raman spectroscopy confirm the oxide formation above 300°C. Orthorhombic MoO<sub>3</sub> phase is usually observed up to 500°C. (**Fig. 1(a)**) and the oxide film appears with two very distinct nanostructures morphologies: (a) large faceted clusters, (b) small granular islands. Few oxide nanorods are also found here (**Fig. 1(b)**). A transition from orthorhombic to hexagonal MoO<sub>3</sub> phase is observed for oxidation at 600°C where the oxide surface appears with a spiral growth morphology (**Fig. 1(b)**). MoO<sub>3</sub> films can thermally be reduced to MoO<sub>2</sub> using CO-CO<sub>2</sub> or H<sub>2</sub> for the purpose of energy storage devices [1-2].



Keywords: Molybdenum oxide, Thermal oxidation, Thin films, E-beam evaporation

**Figure 1.** (a) XRD and (b) FESEM images of Mo films oxidized at different temperature  
References:

[1] Lu Wang *et al.* *ACS Omega* 2019, 4, 22, 20036–20047

[2] Dang, Jie, *et al.* *International Journal of Refractory Metals and Hard Materials* 41 (2013): 216-223.



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## Fabrication of PVA doped Collagen films on wound healing applications

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**Abstract:** The extracellular matrix protein collagen is essential for the healing of wounds. Niacinamide's capacity to heal wounds has been well investigated. As a result, the ability of Niacinamide and marine collagen to promote wound healing was examined. PVA/Collagen/Niacinamide composites were created in the current investigation at varied concentrations. The addition of Niacinamide to the PVA/Collagen matrix did not alter the position of the amide band in the FTIR spectra, but there was a slight shift of the bands corresponding to the hydroxyl, amino, and amide groups in the films towards the higher spectral range, indicating Niacinamide's interaction with the matrix. By using SEM examination, PVA and collagen created a thick fibrous structure that may have come about as a result of collagen fibres aggregating. The PXRD results demonstrated that the PVA/Collagen/Niacinamide films did display crystallinity, and when niacinamide concentration rose, the broad peaks converted into sharp ones. The addition of niacinamide resulted in a decrease in Young's modulus (1010 MPa to 13.4 MPa), a gradual loss of tensile strength (38.8 MPa to 13.9 MPa), and an increase in elongation@break (67.3% to 386.6%), according to the mechanical stability of the composites. Utilizing the NIH3T3 cell line, these test substances were examined utilizing in vitro cytotoxicity and scratch wound tests. PVA/Collagen/Niacinamide (2%) was the test chemical that improved wound healing the best.

**Keywords:** Collagen, PVA, Niacinamide, cytotoxic, wound healing

### References

- (1) Ahmadian, S., Ghorbani, M., & Mahmoodzadeh, F. (2020). Silver sulfadiazine-loaded electrospun ethyl cellulose/polylactic acid/collagen nanofibrous mats with antibacterial properties for wound healing. *International Journal of Biological Macromolecules*, 162, 1555–1565. <https://doi.org/10.1016/j.ijbiomac.2020.08.059>
- (2) Akturk, O., Kismet, K., Yasti, A. C., Kuru, S., Duymus, M. E., Kaya, F., Caydere, M., Hucumenoglu, S., & Keskin, D. (2016). Collagen/gold nanoparticle nanocomposites: A

potential skin wound healing biomaterial. *Journal of Biomaterials Applications*, 31(2), 283–301. <https://doi.org/10.1177/0885328216644536>

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## SYNTHESIS AND CHARACTERISATION OF ZnO AND Ag-ZnO NANOCOMPOSITES

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**Abstract:** ZnO-NPs and Ag/ZnO-NCs are synthesized using *Azadirachta indica* leaf extract as a reducing agent. The synthesis involves boiling on a hot plate mantle at 75°C for 30 minutes, followed by cooling to room temperature. The formation of ZnO NPs and Ag/ZnO NCs is confirmed through UV, PL, XRD, and FTIR spectral analysis. The effect of increasing the percentage of Ag in ZnO NPs reduces the energy band gap. The band gap values determined using UV spectral analysis are found to be 3.12 eV, 3.044 eV, and 2.99 eV, respectively, for ZnO NPs and 1% and 2% Ag/ZnO NCs. Band gap values from PL spectral analysis are 2.93 eV, 2.86 eV, and 2.85 eV, respectively, for ZnO NPs and 1% and 2% Ag/ZnO NCs. Band gap values determined using PL spectra are in agreement within 6.5% of those calculated using UV spectra. The application of this research is to develop numerous materials and products, including plastics, ceramics, glass, cement, rubber (e.g., car tires), lubricants, paints, ointments, adhesives, sealants, pigments, foods (as a source of Zn nutrient), batteries, ferrites, fire retardants, etc.

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## Room Temperature AC Conductivity Study on Polyaniline/Lithium sulfate Composite

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**Abstract:** The present work studied the Alternating Current (AC) responses for Lithium sulfate ( $\text{Li}_2\text{SO}_4$ ) doped Polyaniline (PANI) composites. Pure PANI was synthesized by the in-situ polymerization method. The PANI/ $\text{Li}_2\text{SO}_4$  (PLS) composites were prepared separately by mixing chemically prepared PANI with dopant in a vibration mill. The samples were structurally and morphologically characterized by XRD and SEM studies. The Alternating Current response parameters of PANI,  $\text{Li}_2\text{SO}_4$  and PLS composite were comparatively studied in the frequency range of 40 Hz to 110 MHz at room temperature. An increase in the composite's AC conductivity ( $\sigma_{ac}$ ) was found to be  $2.8 \times 10^{-3} \text{ S cm}^{-1}$  at 1MHz frequency for 30 wt% of the PLS composite. The conductivity increases in composites, compared to PANI and  $\text{Li}_2\text{SO}_4$  observed and discussed based on the electron-hole exchange mechanism.

**Keywords:** Polyaniline, Lithium sulfate, AC studies, electron-hole exchange mechanism, Tangential loss.

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## Green approach for the synthesis of reduced graphene oxide using Bilimbi fruit extract and its efficiency in the degradation of organic dye

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**Abstract:** In textile industries, various dyes are used for coloring purposes. However, most of the dye industries take minimal care in managing contaminated water produced. Hence, a large quantity of effluents is released every day to the water bodies. Therefore, several methods have been adopted to remove the pollutants generated, out of which photocatalytic activity using nanomaterials attracted the research community due to its high efficiency, simplicity, and harmlessness. Green synthesis is one of the feasible methods gaining a lot of popularity due to its ease of use, low cost, good stability, less time-consuming, non-toxic, and reliable for large-scale synthesis. In the present work, Averrhoa Bilimbi fruit extract is used as a potent reducing agent due to the presence of oxalic acid, vitamin C, flavonoids, and other phytochemical constituents that help reduce graphene oxide (GO). The successful reduction of GO has been verified using high-resolution X-ray diffraction (HRXRD) and Raman spectroscopy. Fourier transform infrared spectroscopy (FTIR) is used for identifying the functional groups and field emission scanning electron microscopy (FE-SEM) is used to identify the morphology of the synthesized rGO. The suitability of the synthesized catalyst for the degradation of methylene blue (MB) is tested under both dark and in the presence of UV light using UV-visible spectroscopy. Within 90 minutes, the catalyst degraded 80.75% and 97.32% of the dye in the dark and in the presence of UV light, respectively.

**Keywords:** Reduced graphene oxide; Averrhoa Bilimbi; Green approach; Methylene blue dye

### References

[1] Hasanuzzaman, M.; Ali, M. R.; Hossain, M.; Kuri, S.; Islam, M. S. Evaluation of Total Phenolic Content, Free Radical Scavenging Activity and Phytochemical Screening of Different Extracts of Averrhoa Bilimbi (fruits). *Int Curr Pharm J* **2013**, 2, 92-96. <https://doi.org/10.3329/icpj.v2i4.14058>.

[2] Madhuri, D. R.; Kavyashree, K.; Lamani, A. R.; Jayanna, H. S.; Nagaraju, G.; Mundingamani S. Reduction of Graphene Oxide by *Phyllanthus Emblica* as a Reducing Agent – A Green Approach for Supercapacitor Application. *Mater. Today* **2022**, 49, 865–869. <https://doi.org/10.1016/j.matpr.2021.06.173>.

[3] Suresh, D.; Udayabhanu; Nagabhushana, H.; Sharma, S. C. Clove Extract Mediated Facile Green Reduction of Graphene Oxide, Its Dye Elimination and Antioxidant Properties. *Mater. Lett.* **2015**, 142, 4–6. <https://doi.org/10.1016/j.matlet.2014.11.073>.

[4] Song, P.; Zhang, X.; Sun, M.; Cui, X.; Lin, Y. Synthesis of Graphene Nanosheets via Oxalic Acid-Induced Chemical Reduction of Exfoliated Graphite Oxide. *RSC Adv.* **2012**, 2 (3), 1168–1173. <https://doi.org/10.1039/c1ra00934f>.

## Structural, morphological, vibrational and functional properties of entropy-stabilized (Cu,Zn,Ni,Co)O

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**Abstract:** High entropy oxides (HEO) or entropy-stabilized oxides (ESO) are the modern class of multicomponent advanced ceramic materials and have attracted significant attention since Rost et al [1] synthesised the first high entropy oxides in 2015. The concept of high entropy oxide is derived from high entropy alloy. Configurational entropy ( $S_{\text{conf}}$ ) of oxide can be calculated according to the equation,  $\Delta S_{\text{conf}} = -R \left[ \left( \sum_{i=1}^N x_i \ln x_i \right)_{\text{cation} - \text{site}} + \left( \sum_{j=1}^M x_j \ln x_j \right)_{\text{anion} - \text{site}} \right]$  where  $x_i$  and  $x_j$  represent mole fraction of elements present in the cation and anion site respectively and R is the universal gas constant. The huge complexity of the systems and the dominant role of entropy in their stabilization make the properties unpredictable. In this regard, the present study deals with the possibility and feasibility of synthesizing the transition metal high entropy oxides, (CuZnNiCoMg)O via a chemical (co-precipitation method) process. PXRD pattern confirms the phase formation of single phase (CuZnNiCoMg)O. Surface morphology and chemical composition were analyzed using FE-SEM and EDAX spectrums. Further, structural, vibrational and functional properties of (CuZnNiCoMg)O were studied and the experimental results will be presented.

Keywords: High entropy oxides, entropy stabilized oxides, ceramic materials.

### References:

- [1] C.M. Rost, E. Sachet, T. Borman, A. Moballegh, E.C. Dickey, D. Hou, J.L. Jones, S. Curtarolo, J.P. Maria, Entropy-stabilized oxides, Nat Commun. 6 (2015). <https://doi.org/10.1038/ncomms9485>.

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## Synthesis and Characterization of Polyaniline/Cobalt ferrite nanocomposites

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**Abstract:** The synthesis of polyaniline (PANI)/CoFe<sub>2</sub>O<sub>4</sub> nanocomposites involved in situ polymerization of aniline monomer with CoFe<sub>2</sub>O<sub>4</sub> nanoparticles. The CoFe<sub>2</sub>O<sub>4</sub> nanoparticles were prepared using a simple sol-gel auto-combustion method. The X-ray diffraction (XRD) technique was used to investigate the structural properties of the resulting nanocomposites. The average crystallite size of the CoFe<sub>2</sub>O<sub>4</sub> nanoparticles was found to be 31 nm. The FTIR spectra for both PANI and PANI/ CoFe<sub>2</sub>O<sub>4</sub> nanocomposites are similar with the characteristic peak value of PANI observed at 1143 and 1483 cm<sup>-1</sup>. The peaks of the PANI/ CoFe<sub>2</sub>O<sub>4</sub> nanoparticles shift to lower wave numbers. This indicates that the PANI/ CoFe<sub>2</sub>O<sub>4</sub> powders are composed of CoFe<sub>2</sub>O<sub>4</sub> nanocomposites. The prepared nanocomposites possess properties that make them an attractive candidate for a wide range of applications.

**Keywords:** Polyaniline, in-situ polymerization, ferrite nanoparticles.



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# PREPARATION AND COMPOSITION OPTIMIZATION OF CHITOSAN:DEXTRAN BIOPOLYMER BLEND FILMS FOR ELECTROLYTE APPLICATION

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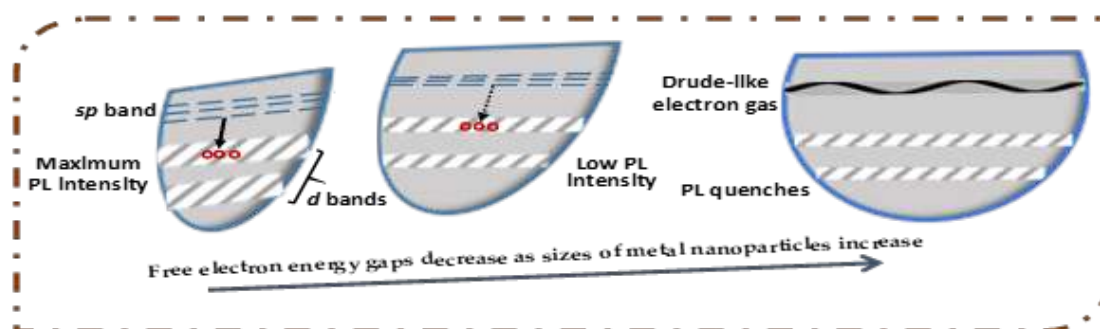
**Abstract:** In this current investigation, we fabricated solid biopolymer blend films utilizing chitosan (CS) and dextran (DN), both being natural biopolymers. These films were prepared with diverse compositions through the solution casting method, and their structural characteristics were assessed using X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR). The FTIR analysis unveiled compelling evidence of intermolecular interactions between these two polymers, primarily attributed to hydrogen bonding. Remarkably, our XRD deconvolution analysis revealed that the poly-blend composition consisting of 60 wt.% chitosan and 40 wt.% dextran, designated as B4, exhibited the most pronounced amorphous character with a notably low degree of crystallinity. Moreover, our investigation into dielectric spectroscopy disclosed that the B4 sample manifested the highest dielectric constant among all compositions, suggesting its potential suitability as a polymer host for applications in electrolyte systems.

**Keywords:** Biopolymer blend films; XRD analysis; Dielectric study; Solution casting; Amorphous

## Optical and photoluminescence properties of metal-semiconductor nano-hybrid materials

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**Abstract:** Bridging the gap between the atomic structures and bulk matters, nanomaterials are of great research interests for fundamental understanding as well as for different application perspectives. In dictating the optical properties of metal nanoparticles, for instance, quantum nature of free electrons significantly dominates and plays very crucial roles at the level of nanoscale dimensions of materials. (1). As consequences of the quantum-confinement effects on the conduction electrons, optical absorption and the light emission properties of metal nanoparticles become very exciting, and are found to be strongly dependent on the physical dimensions of the nanomaterials. (2). Subtle detection of optical phenomena associated with the excited many-body electronic processes in metal nanoparticles, for example, are very fascinating but definitely challenging. Here we make a fresh attempt to find out how the growth of metal nanoparticles can snuff out the light emission from various samples. Novel quantum-mechanical and pedagogic interpretations of the underlying processes about the observed interesting quenching phenomena will be reviewed and discussed here. A schematic diagram is shown to explain the quenching of light emission with the growth of nanoscale metal particles. The understanding will be able to help to fine tune the optoelectronic properties of plasmonic systems as well as to harness potential applications of the nanoscale materials of interest.



**Figure.** Schematic diagram of photoluminescence quenching with growth of metal nanoparticles.

**Keywords:** Chemical Synthesis; Photoluminescence; Optical; Spectroscopy;

### References:

1. Scholl, J. A.; Koh, A. L.; Dionne, J. A. Quantum plasmon resonances of individual metallic nanoparticles. *Nature* **2012**, 483, 421-428; doi:10.1038/nature10904
2. Gangopadhyay, P. Optical, photoluminescence and vibrational spectroscopy of metal nanoparticles. *Semiconductor Nanocrystals and Metal Nanoparticles: Physical Properties and Device Applications*; CRC Press, 2017, 127-190.

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## Investigations on Spray Pyrolyzed NiO Thin Films for Gas Sensing Applications

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**Abstract:** We conducted a study focused on the characterization of NiO thin films synthesized through the spray pyrolysis technique. The structural studies were carried out by using XRD. The XRD graph reveals that NiO has polycrystalline in nature and the most intense peak is along (111) plane. The optical characterization of NiO were done by UV- Vis spectrometer. The energy band gap of sprayed NiO is found to be 3.64 eV. The presence of defects was investigated by analysing the emission peaks in Photoluminescence analysis.

Keyword: NiO, XRD, Energy bandgap, Photoluminescence.

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## Electronic and interfacial properties of 2-dimensional MXene/blue phosphorene heterostructures and effect of external tuning parameters

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**Abstract:** In recent years, two-dimensional materials have emerged as promising candidates for next-generation electronic and optoelectronic applications due to their unique electronic and optical properties. Among these materials, MXenes, a family of two-dimensional transition metal carbides and nitrides, have garnered significant attention for their exceptional electronic and structural characteristics. Functionalized Mxene and creation of van der Waals heterostructures with other 2D layered materials are important for substantial scientific interest as well as its potential applications. In this study, we employ density functional theory to investigate various Mxene heterostructures with phosphonene. Furthermore, we explore the influence of strain, and electric fields on these heterostructures. Our findings reveal band gap tuning, band alignment, and charge transfer of these heterostructures. Moreover, our investigation into the effects of strain and electric fields reveals a transition from type-I to type-II and/or indirect to direct band gap in the considered heterostructures. In conclusion, our study sheds light on the tunable electronic properties of MXene heterostructures, offering valuable insights for the design and engineering of next-generation electronic devices and optoelectronic applications.

**Keywords:** First principle calculation, Mxene, Blue phosphorous, heterostructure, External tuning parameter

**Reference:** Gogotsi et al, The rise of MXenes, ACS nano, 13(2019)8491--8494

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## Nickel Zinc Nanoferrites Doped with Cobalt by SUCROSE Method: Structural and Antibiological Properties

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**Abstract:** The Cobalt doped nickel zinc nanoferrites with composition  $\text{Ni}_{0.45}\text{Zn}_{0.55-x}\text{Co}_x\text{Fe}_2\text{O}_4$  where  $x = 0.0, 0.1, 0.2$  and  $0.3$  were synthesized using Sucrose method. The obtained nanoferrites were examined using XRD which verified the formation of single crystalline cubic spinel structure. TEM analysis was utilized to study their morphological & structural properties. The ferrite particles showed mono disperse nature and particle size was found to be around 15nm. Also, the antibiological properties were explored using Kirby-Bauer Disk Diffusion Susceptibility Test. The nanoferrites showed promising antibiological properties.

**Keywords:** Sucrose method; nanoferrites; structural properties; antibiological properties

**References:**

- [1] Azadmanjiri, J. (2008). Structural and electromagnetic properties of Ni–Zn ferrites prepared by sol–gel combustion method. *Materials Chemistry and Physics*, 109(1), 109-112.
- [2] Molakeri, A. S., Kalyane, S., Kulkarni, A. B., & Mathad, S. N. (2018). Structural analysis of nano ferrites synthesized by combustion and microwave methods. *International Journal of Self-Propagating High-Temperature Synthesis*, 27, 44-50.
- [3] Hudzicki, J. (2009). Kirby-Bauer disk diffusion susceptibility test protocol. *American society for microbiology*, 15, 55-63.

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## Effect of Chelating Agents on Bismuth Ferrite Nanoparticle Synthesis: Structural, Optical, and Chemical Characterization

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**Abstract:** Bismuth ferrite (BFO) nanoparticles were carefully synthesised through a cost-effective, low-temperature chemical auto-ignition technique, followed by calcination at 550°C for one hour. The influence of various chelating agents on the physicochemical properties of these nanoparticles was systematically investigated using various characterization techniques. X-ray diffraction (XRD) analysis unveiled the rhombohedral, perovskite crystal structure of the synthesised nanoparticles. Notably, BFO nanoparticles produced with ascorbic acid as the chelating agent exhibited a more compact size of 26 nm, in contrast to those synthesised with citric acid (35 nm) and grape seed extract (40 nm). UV spectroscopy data revealed a noteworthy disparity, as BFO synthesized with ascorbic acid exhibited enhanced absorbance in the visible spectrum. Additionally, chelation with both citric acid and grape seed extract resulted in a noticeable blue shift in the energy gap, measuring 2.19 eV and 2.17 eV, respectively, in contrast to the ascorbic acid chelation agent-driven synthesis, which yielded an energy gap of 2.12 eV, further differentiating their optical properties. Energy-dispersive X-ray spectroscopy (EDS) analysis provided definitive evidence of the maintenance of stoichiometric ratios in the synthesized samples, thus establishing the integrity and uniform composition of the BFO nanoparticles. Subsequent examination employing field emission scanning electron microscopy (FE-SEM) emphasised the consistent size homogeneity of the synthesised particles. Furthermore, this analysis corroborated the X-ray diffraction (XRD) findings, providing additional validation that BFO nanoparticles synthesised with ascorbic acid were indeed of smaller dimensions in comparison to those synthesised using citric acid and grape seed extract as chelating agents. Moreover, Fourier-transform infrared spectroscopy (FTIR) analysis conclusively confirmed the presence of essential Bi-O and Fe-O bonds within the synthesized BFO nanoparticles, solidifying their structural characteristics. In conclusion, the results suggest that ascorbic acid serves as a superior chelating agent for the synthesis of BFO nanoparticles.

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## Synthesis, Spectral studies, X-ray diffraction and Biological study of tert-butyl 4-(2-ethoxy-2-oxoethyl)-piperazine-1-carboxylate and tert-butyl 4-(2-hydrazino-2-oxoethyl)piperazine-1-carboxylate

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**Abstract:** Two derivatives of tert-butyl 4-(2-ethoxy-2-oxoethyl)-piperazine-1-carboxylate (1) and a hydrazide derivative tert-butyl 4-(2-hydrazino-2-oxoethyl)piperazine-1-carboxylate (2) were synthesized and were characterized by FT-IR, <sup>1</sup>H & <sup>13</sup>C NMR and LCMS spectroscopic studies. The structures of both 1 and 2 were further confirmed by single crystal X-ray diffraction analysis. The antimicrobial activities of both the compounds have been studied against several microorganisms, and were found to be moderately active.

**Keywords:** Piperazine Crystal structure, Hirshfeld surface Antibacterial activity Antifungal activity

### References

1. N.R. Mohan, S. Sreenivasa, K.E. Manojkumar, T.M.C. Rao, B.S. Thippeswamy, P.A. Suchetan, (2014) J. Braz. Chem. Soc. 25, 1012–1020



2. P.A. Suchetan, S. Sreenivasa, K.S. Srivishnu, H.N. Lakshmikantha, G.M. Supriya, S. Naveen, N.K. Lokanath, (2015) *Z. Kristallographie*. 230, 543–550
3. K Manjunatha, B Poojary, P.L. Lobo, J. Fernandes, N.S. Kumari, (2010) *European Journal of Medicinal Chemistry*, 45, 5225-5233.

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## EVALUATION STUDIES OF CROWN ETHER FOR SEPARATION OF STRONTIUM FROM FAST REACTOR - SIMULATED HIGH-LEVEL LIQUID NUCLEAR WASTE SOLUTION.

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**Abstract:** Strontium is one of the important elements that has several applications in nuclear medicine. People use strontium for conditions such as tooth sensitivity, osteoporosis, osteoarthritis, prostate cancer and others. Nuclear waste from the reactors after the production of electricity is one of the major sources of strontium. Along with other elements in nuclear waste, the extraction of strontium has gained the focus of researchers today. In this research paper, the simulated nuclear waste is taken as the source and analyzed. The extraction of Sr(II) ions from fast-reactor simulated high-level liquid waste (FR-SHLLW) was studied using a solvent extraction method employing crown ether in octanol as the extracting phase. The effect of pre-saturation of the extracting phase was studied by pre-equilibration of the crown ether phase with 4 M nitric acid. The co-extraction of other elements along with Sr(II) was quantified by ICP-OES and flame AAS analysis of aqueous phases before and after extraction. The recovery of all the extracted metal ions by stripping with 0.1 M nitric acid was also studied in three stages and the results were compared. This study is going to help further in the field of nuclear medicine research.

**Keywords:** Strontium, FR-SHLLW, Solvent Extraction, Crown Ether.

## Synergetic effect of the sodium perchlorate salt on the ion conduction properties of Poly (vinyl alcohol)-Chitosan polymer blend for energy storage applications

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**Abstract:** This study mainly focuses on the systematic investigation of the effect of NaClO<sub>4</sub> doping on the structural, electrical and ion transport properties of biodegradable blend based on poly (vinyl alcohol) (PVA)-Chitosan (CS). Optimized weight ratio of PVA: CS (60:40) was taken as the polymer host. XRD studies indicate the increase in the amorphous nature of the polyblend. FTIR spectroscopy reveals the complexation of the salt with polar groups of the polymer matrix via coordinate bonds leading to the microstructural modifications. Room temperature Electrochemical Impedance spectroscopy (EIS) studies revealed an increase in the ionic conductivity by four orders  $(3.20 \pm 0.38) \times 10^{-4}$  S/cm) with respect to the pure blend  $((1.43 \pm 0.26) \times 10^{-8}$  S/cm). Nyquist plot fitting based on electrical equivalent circuit has been employed to study ion transport parameters at room temperature indicating strong influence of carrier concentration (n) on conductivity rather than mobility ( $\mu$ ) and diffusion coefficient (D). Chronoamperometry measurements based on Wagner polarization technique indicated the major charge carriers are ions suggesting the use of the optimum sample as separator/ electrolyte in energy storage devices.

**Keywords:** polymer electrolytes; charge transport; transference number; dielectric properties; poly(vinyl alcohol)

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## Structural, morphological and luminescence properties of $\text{Ba}_2\text{Al}_2\text{SiO}_7:\text{Dy}^{3+}$ Phosphors

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**Abstract:**  $\text{Ba}_2\text{Al}_2\text{SiO}_7:\text{Dy}^{3+}$  (BASO:  $\text{Dy}^{3+}$ ) phosphors for white light emission were prepared using Combustion Synthesis Method followed by annealing at 1100° C for 12 Hours. X-ray Diffraction analysis was done to find out phase structure and lattice parameters. Fourier Transform Infrared (FTIR) spectra was recorded to identify the functional groups present in the sample. Scanning electron microscopy (SEM) was performed to get the details of Surface morphology. The XRD plots were matched well with the reference data and the tetragonal phase formation was identified. There were no additional peaks observed with the addition of dopant. Fourier Transform Infrared Spectroscopy (FTIR) was carried out to identify the presence of Ba-O, Si-O, Al-O band vibrations. The effect of the doping concentration on the luminescence properties of BASO:  $\text{Dy}^{3+}$  phosphors was investigated using photoluminescence (PL) studies. The  $\text{Dy}^{3+}$  doped BASO phosphors give white light emission with blue and yellow light emission. Thus BASO:  $\text{Dy}^{3+}$  phosphors are the best candidates for white LEDs.

## Coconut Industry Waste to Sustainable Biofuel: A Cleaner 'Waste to Fuel' Approach

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**Abstract:** Due to the exhaustion of fossil fuels and increasing demand for energy, it is necessary to identify renewable energy feedstock sources to substitute for fossil fuels. This is a challenging task for researchers. The coconut waste scum oil (CSO) can be considered as one of the substitute feedstock for biodiesel production. In the recent advancements, identification of economically feasible feedstocks for biodiesel production is crucial. In the current study, coconut waste scum oil is collected from coconut industries and used as biodiesel feedstock. The biodiesel production was conducted by two step method using CSO. In the first step, esterification of methanol with free fatty acids (FFA) in CSO was studied using acid catalyst. In the second step, green synthesized CuO NPs was used as heterogeneous catalyst in transesterification process to convert esterified CSO to biodiesel. The synthesized CuO NPs was characterized through XRD, BET and FTIR. At the optimum reaction conditions for transesterification process are 4 wt% CuO dosage, 2 h reaction time, 12:1 methanol/oil ratio and 60 min reaction time. Under these optimum conditions biodiesel yield from CSO obtained 96.3%. After 4 cycles of reusability, the biodiesel yield reaches >80% which shows the CuO has simple recovery and stable activity. Finally, the fuel property of produced biodiesel was evaluated as per the ASTM 6751 standards.

**Keywords:** coconut scum oil, CuO, free fatty acids, esterification, transesterification biodiesel

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## Biosynthesis and Catalytic Evaluation of Ag-Cu Bimetallic Nanoparticles for the degradation of organic dyes

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**Abstract:** Green synthesis of nanoparticles is a growing field of research owing to its advantages over physical or chemical methods as it is cost-effective, reduces pollution and enhances environmental and human health safety. In the present work, silver-copper bimetallic nanoparticles (Ag-Cu BNPs) are synthesized by green method. *Colocasia esculenta* plant extract was used to biologically reduce silver nitrate and copper nitrate trihydrate to synthesize the Ag-Cu BNPs. *Colocasia esculenta* contains ascorbic acid, folic acid and other vitamins (A,B, and C) and hence it acts as a reducing agent in the synthesis of BNPs. UV-visible spectroscopy, Scanning Electron Microscopy (SEM) with energy dispersive X-ray analysis (EDAX) was performed to confirm the formation of BNPs, Fourier Transform Infrared spectroscopy (FTIR) to identify the functional groups present and X-ray diffraction (XRD) to find the crystallinity of the prepared BNPs. The Ag-Cu BNPs exhibited enhanced catalytic activity for the reduction of P-Nitrophenol, Rhodamine B. By tuning the properties of these BNPs, they can be used in medical waste-water treatment.

**Keywords:** Bimetallic nanoparticles; Catalytic Activity; P-Nitrophenol; Rhodamine-B

## Electron Irradiation Effects on Structural, Optical and Electrical Properties of ZnSe QDs Embedded in Methyl Cellulose

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**Abstract:** In recent years, wide band gap semiconductors have gained widespread recognition due to their applications in blue, green LEDs, UV-blue emitting laser diodes, bio-labeling, UV detectors and scintillation detectors. Materials at the nanoscale offer advantages owing to their quantum confinement effect and substantial surface-to-volume ratios. Quantum Dots (QDs) comprised of wide band gap semiconductors is particularly useful for the domain of short-wavelength photons. Investigations on both the synthesis and containment of QDs are crucial for their utilization in device fabrication. However, their high surface area renders them susceptible to instability when exposed to ionizing radiations and agglomeration issues. A necessary survey involves studying the effects of radiation on QDs to incorporate these materials into radiation-associated devices. Studies involving radiation-assisted surface modifications have revealed that QDs are vulnerable to electron, gamma, UV and other ionizing radiations. To avoid undesirable chemical interactions in the presence of radiation, it is essential to improvise the stability of QDs. In view of the above, in the present study, high luminescent ZnSe QDs synthesized hydrothermally are incorporated into a Methyl Cellulose (MC) polymer matrix. The resulting ZnSe QDs-MC Polymer Nano-Composites (PNCs) are then exposed to graded doses of 10 MeV Electron Beam (EB) radiation, specifically 1 kGy, 3 kGy, 5 kGy, and 25 kGy. Pure MC polymer, pristine and irradiated PNCs undergo comprehensive structural, optical and electrical characterizations. X-ray Diffraction (XRD) analysis reveals that EB irradiation up to 25 kGy does not induce noticeable changes in the structural and crystalline properties of the PNCs. UV-visible absorbance spectra demonstrate that the change in band gap energy is less than 3%. Even after exposure to 25 kGy EB radiation, marginal variations in the fluorescence quantum yield (FQY) of the PNC are observed. This consistent pattern is also reflected in their A.C conductivity behavior. This multidimensional analysis, suggests the potential utilization of these PNCs in radiation environments and space-related applications.

**Keywords:** ZnSe QDs; MC; EB irradiation; FQY

*References*

1. K. Priya, K. Rao. Gowrish, V.K. Ashith, G. Sanjeev, V. Pal Verma, V. Chandra Petwal, J. Dwivedi, “The effect of 8 MeV electron beam irradiation on the structural, optical and photoluminescence properties of ZnS thin films”, *Ceram. Int.* 45 (2) (February 2019) 2576–2583. doi.org/10.1016/j.ceramint.2018.10.188.
2. S. Chethan Pai et al., “Electron irradiation effects on TGA-capped CdTe quantum dots,” *J Phys D Appl Phys*, vol. 46, no. 17, May 2013, doi: 10.1088/0022-3727/46/17/175304.
3. S. P. Raju, K. Hareesh, S. Chethan Pai, S. D. Dhole, and G. Sanjeev, “Preparation of fluorescent CdTe@CdS core@shell quantum dots using chemical free gamma irradiation method,” *J Lumin*, vol. 192, no. January, pp. 17–24, 2017, doi: 10.1016/j.jlumin.2017.06.019.



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## Structural, magnetic and electrical properties of Heusler alloys $\text{Cr}_2\text{MnZ}$ ( $Z = \text{Al, Si, Ge, Sn}$ and $\text{In}$ )

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**Abstract:** Heusler alloys are fascinating materials in the field of condensed matter physics and materials science due to their unique properties and potential applications. Studying disorders or defects within Heusler alloys can offer several advantages. In this work, polycrystalline  $\text{Cr}_2\text{MnZ}$  ( $Z=\text{Al, Si, Ge, Sn}$  and  $\text{In}$ ) full Heusler alloy, has been synthesized by vacuum arc melting technique and its structural and magnetic properties have been studied. The measured x-ray diffraction (XRD) pattern shows the signature of a disordered structure. X-ray photoelectron spectroscopy (XPS) also has been studied for these samples. From the magnetization measurements, there is no evidence of ferromagnetic ordering observed in this system. The experimentally observed structural and magnetic properties are found to be significantly different from the theoretically predicted properties of the ordered cubic  $L2_1$  structure. Both the temperature dependent electrical resistivity and hall resistivity in presence of magnetic field shows an anomalous behaviour for this system, due to atomic disorder which strongly influences the magnetic and transport properties of  $\text{Cr}_2\text{MnZ}$  samples. Defects will lead to the emergence of new phenomena or behaviors that are absent in perfect, ordered structures. This exploration can uncover unexpected and useful properties in Heusler alloys. The tailoring of Heusler alloys makes them as more energy efficient and versatile for spintronics applications.

**Keywords:** Heusler alloys; Magnetism; Defects.

Reference:

1. Jubair, M., et al. "Pressure dependent structural, elastic and mechanical properties with ground state electronic and optical properties of half-metallic Heusler compounds  $\text{Cr}_2\text{YAl}$  ( $\text{Y} = \text{Mn, Co}$ ): first-principles study." *Heliyon* 7.12 (2021): e08585.
2. Qi, Santao, et al. "First-principles study on the band structure, magnetic and elastic properties of half-metallic  $\text{Cr}_2\text{MnAl}$ ." *Modern Physics Letters B* 29.24 (2015): 1550139.

## STUDY OF STRUCTURAL AND OPTICAL PROPERTIES OF SPRAY PYROLYZED NiSnO<sub>3</sub> THIN FILMS

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**Abstract:** Nickel Tin Oxide (NiSnO<sub>3</sub>) is a transparent conductive oxide, which has been investigated in the field of electronics and energy devices due to its conductivity and electrochemical properties. Herein, NiSnO<sub>3</sub> films were successfully prepared on glass substrate via chemical spray pyrolysis technique and its physical properties were examined. The deposited films annealed at 450 °C at different time intervals starting from 2 hours to 8 hours. The X-ray diffraction (XRD) pattern confirmed the formation of perovskite NiSnO<sub>3</sub>. The crystalline nature of the film increases with increasing annealing duration. The average crystallite size is found to be ~8 nm. UV-Visible spectroscopy was carried out for all samples. The energy bandgap reduces from 3.64 eV for the as deposited sample to 3.52 eV for the 4 hours annealed sample. The transmittance of the corresponding sample was found to be more than 70%. These results promise for a material to be used for photovoltaic, gas sensors and high energy storage device applications.

**Keywords:** Nickel Tin Oxide; Spray pyrolysis; Thin films; Annealing.

*References:*

[1] A. Mhamdi *et al.*, "Structural, surface morphology and optical properties of NiSnO<sub>3</sub> thin films prepared using spray technique," *Opt. Mater. (Amst.)*, vol. 47, no. September, pp. 386–390, 2015, doi: 10.1016/j.optmat.2015.06.009.

[2] A. A. Yadav and U. J. Chavan, "Electrochemical supercapacitive performance of spray deposited NiSnO<sub>3</sub> thin films," *Thin Solid Films*, vol. 634, pp. 33–39, 2017, doi: 10.1016/j.tsf.2017.05.007.

[3] M. Khatun, P. Mitra, and S. Mukherjee, "Effect of band gap and particle size on photocatalytic degradation of NiSnO<sub>3</sub> nanopowder for some conventional organic dyes," *Hybrid Adv.*, vol. 4, no. August, p. 100079, 2023, doi: 10.1016/j.hybadv.2023.100079.

[4] P. E. Saranya and S. Selladurai, "Facile synthesis of NiSnO<sub>3</sub>/graphene nanocomposite for high-performance electrode towards asymmetric supercapacitor device," *J. Mater. Sci.*, vol. 53, no. 23, pp. 16022–16046, 2018, doi: 10.1007/s10853-018-2742-1.

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## Synthesis, spectral, single crystal structure study of (*E*)- para nitro-*N'*-(substituted nitrobenzylidene)benzenesulfonohydrazides

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### ABSTRACT

**Abstract:** Aroyl hydrazones can act as neutral, monoanionic, bidentate or tridentate ligand depending on the substituents and the reaction conditions owing of the presence of a number of bonding sites<sup>1</sup>. Hydrazones are used in non-linear optics, sensors and in the catalytic processes<sup>2</sup>. The structural study of these compounds is needed to understand the biological and medicinal activities of these compounds. In an effort to explore the effect of site of substitution on the structural parameters and packing mechanism, two nitro derivatives of 4-nitrobenzenesulfonohydrazide, namely (*E*)-*N'*-(3-nitrobenzylidene)-4-nitrobenzenesulfonohydrazide, (I) and (*E*)-*N'*-(4-nitrobenzylidene)-4-nitrobenzenesulfonohydrazide, (II) have been synthesized, characterized by IR spectra in the solid state and <sup>1</sup>H and <sup>13</sup>C NMR spectra in solution and studied for their crystal structures to analyse the effect of nitro group at *meta*- or *para*- position of the benzylidene ring on the structural parameters and the H-bonding interactions in these compounds. Compounds (I) and (II), crystallize with one molecule in the asymmetric unit, with generally similar conformations. The hydrogen bonding pattern of (I) and (II) vary significantly. In the crystal structure of *meta*-nitro derivative, (I), a bifurcated N-H···O hydrogen bonding from the amino H atom to both nitro O atoms enclosing an R<sub>2</sub><sup>1</sup>(4) ring motif generates chains running along the *c*-axis. A pair of C-H···O interactions involving R<sub>2</sub><sup>2</sup>(10) ring motif further stabilize the molecular chains and are interconnected by a pair of C-H···O interactions generating inversion dimers which results in the formation of a 3-D network structure. In the crystal of (II), N-H···O interactions in the molecules show a zig-zag head-to-tail stacking, along the *b*-axis direction. The C—H···O interactions further stabilize these molecular chains with the generation of R<sub>2</sub><sup>2</sup>(10) loops.

**Keywords:** Hydrazones; hydrogen bonding; interactions

**References:**

1. P. A. Suchetan, S. Foro & B. T. Gowda, *Acta Cryst.* **E68** (2012) o1327, o1507.
2. K. Shakuntala, S. Naveen, N. K. Lokanath, P. A. Suchetan & M. Abdoh, *Acta Cryst.* **73** (2017) 833.
3. S. Naveen, A. G. Sudha, E. Suresha, N. K. Lokanath & P. A. Suchetan *Z. Kristallogr.* **132** (2017) 1.
4. P. K. Murthy, V. Suneetha, S. Aramakovi\_, S. J. Aramakovi, P.A. Suchetan, L. Giri & S. Rao, *J. Mol. Struct.* **1153** (2018) 212.

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## Copper Oxide NPs/Functionalized Multi-walled Carbon Nanotubes: Catalyst in Action for Efficient Organic Dye Degradation

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**Abstract:** The degradation of dyes is a tedious task due to their tenacious and stable nature. Dye-contaminated water can cause severe health issues to humans, animals, and aquatic species. The removal of dyes from contaminated water systems necessitates efficient and eco-friendly degradation methods. In the present study, copper oxide/functionalized multi-wall carbon nanotubes (CuO/F-MWCNTs) nanohybrid was synthesized. The synthesized nanohybrid was characterized using X-ray diffraction (XRD) for structural analysis, scanning electron microscopy (SEM) for morphological analysis, and Fourier transform infrared spectroscopy (FTIR) for functional group identification. The synthesized nanocomposite was used as a catalyst for the degradation of organic dyes Rhodamine B (RhB), p-Nitrophenol (PNP) and mixture of these two dyes in the presence of sodium borohydride (NaBH<sub>4</sub>). The degradation efficiency was evaluated by monitoring the changes in dye concentration over time using UV-Vis spectroscopy. The results demonstrated that the CuO/F-MWCNTs composite exhibited remarkable catalytic activity in degrading RhB, PNP and mixture of these dyes under optimized conditions.

**Keywords:** CuO/F-MWCNTs, Rhodamine B, p-Nitrophenol, Catalytic activity.

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## EFFECT OF COPPER ON STRUCTURAL AND GAMMA SHIELDING PROPERTIES OF NICKEL - CADMIUM NANOFERRITES.

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**Abstract:** Ferrite nanoparticles with the composition  $\text{Ni}_{0.6}\text{Cu}_x\text{Cd}_{0.4-x}\text{Fe}_2\text{O}_4$  (where  $x = 0, 0.1, 0.2$  and  $0.3$ ), were synthesized through the sol-gel auto combustion technique employing sucrose as a fuel. The formation of the single phase spinel structure and the influence of copper concentration on the structural properties of these nanoparticles were explored through various characterization techniques, including X-ray diffraction (XRD), scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDS) and Fourier-Transform Infrared spectroscopy (FTIR). The XRD analysis show the formation spinel structure without the presence of any additional peaks. The lattice parameter determined are found to be in the range  $8.34 \text{ \AA}$  to  $8.39 \text{ \AA}$ . Notably, an inverse relationship between copper concentration and crystallite size is observed. The increase in  $\text{Cu}^{2+}$  concentration in the composition leads to decrease in crystallite size from  $60.75 \text{ nm}$  to  $25.48 \text{ nm}$ . SEM-EDS technique is used to examine the surface morphology of all synthesized samples, confirming the presence of elements in the specified composition and showcasing fine-grained structures. FTIR studies highlighted two absorption bands,  $\gamma_1$  and  $\gamma_2$ , corresponds to tetrahedral and octahedral sites in the range of  $600 \text{ cm}^{-1}$  to  $400 \text{ cm}^{-1}$ , confirming the formation of the spinel structure in the ferrite. The Mass Attenuation coefficient ( $\mu_m$ ) of gamma rays for the samples were studied using NaI(Tl) detector and gamma source ( $^{137}\text{Cs}$ ). The experimental values obtained were found to be in good agreement with the data available on the NIST XCOM website, validating the accuracy of the measurements.

**Keywords:** Spinel ferrite; Sol-gel; SEM-EDS; NIST XCOM

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## Multi-Functional Indium Sulphide Thin Films for Photodetection, Vacuum Pressure Sensing, and Ammonia Detection

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**Abstract:** This research introduces an innovative device employing Indium Sulphide ( $\text{In}_2\text{S}_3$ ) thin films, designed for efficient photodetection, vacuum pressure sensing, and ammonia detection. A systematic optimization process, focusing on structural, optical, and electrical film properties, precedes its application. The distinctive crystal structure of  $\text{In}_2\text{S}_3$ , characterized by interband defect levels enhancing light sensitivity, and the rapid adsorption/desorption dynamics of surface groups, collectively contribute to its superior sensing capabilities. The films were deposited with precision in a high-vacuum environment through the thermal evaporation of  $\text{In}_2\text{S}_3$  powder. Comprehensive testing for light, vacuum pressure, and ammonia detection parameters reveals a consistent, periodic sensor response with quick response and recovery times. Beyond its multifunctionality, this device represents a sustainable technological approach, promising economic, environmental, and energetic advantages, making it a promising candidate for diverse sensing applications.

**Keywords:** Multi-functional, indium sulphide, defect analysis, photodetector, vacuum pressure sensor, ammonia sensor



## Synthesis, Characterization and X-ray diffraction Study of some Substituted Glutaramides

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**Abstract:** Amides are the important organic compounds in which the structure and properties of the amide group has been the subject of much interest<sup>1</sup>. The delocalisation of nitrogen lone pair electron into the  $\pi$ -system of the carbonyl group produces partial double bond character in the  $-\text{C}(\text{O})-\text{N}$  bond to generate a 1,3-dipole which is responsible for the planar nature of amide group and the existence of configurational isomers. The donor-acceptor properties of the amide moiety manifest in acid-base and complexing interactions<sup>2-4</sup>. There are a very few reports on the spectral and structural studies of these compounds. As a part of continuing efforts of correlating spectroscopic parameters with the chemical bond parameters, and hence to correlate their structure – reactivity relationships several substituted N, N'-bis(substitutedphenyl)-glutaramides of the general formula,  $i\text{-XC}_6\text{H}_4\text{-NHCO}-(\text{CH}_2)_3\text{-CONH-C}_6\text{H}_4\text{X-i}$  ( $i\text{-X} = \text{H}, 4\text{-CH}_3, 4\text{-Cl}, \text{ or } 2\text{-NO}_2$ ) have been synthesized and characterised by IR and NMR spectra. The crystallographic data are analysed from the single crystal X-ray structures of these compounds to explore the effect of substituents on the structural parameters of these compounds. The comparison of the crystal data among these compounds and with those of the corresponding N, N'-bis(substitutedphenylsulfonyl)-glutaramides reveals that they show striking structural features with change of substitution either in the phenyl ring or in the chain connecting the two aryl rings.

**Keywords:** Amides; hydrogen bonding; interactions

### References:

1. S. Harkema, R. J. Gaymans & G. J. van Hummel, *Acta Cryst.* C39 (1983) 385.
2. V. Tereshko, E. Navarro, J. Puiggalf & J. A. Subirana, *Macromolecules* 26 (1993) 7024.
3. S. Samai & K. Biradha, *CrystEngComm*.3 (2009)
4. S. Anjum. M. I. Chaudhary, S. Ali, H. K. Fun & Atta-ur-Rahman, *Acta Cryst.* E61 (2005) o3001.

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## Effect of capping agent and reaction time on hydrothermal synthesis of CuInS<sub>2</sub> QDs

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**Abstract:** Zero dimensional nanoparticles or Quantum dots(QDs) are used extensively as fluorescent material in optoelectronics and biological applications. Fluorescent colloidal CuInS<sub>2</sub> QDs, with 3-Mercapto propionic acid(MPA) capping, were synthesized using hydrothermal method. Effect of concentration of capping agent and change in reaction time of the samples were studied. Studies on optical properties of the QDs were carried out by using UV-Vis absorption and fluorescence spectroscopies. X-Ray diffraction(XRD) and Fourier Transform Infrared spectroscopy(FTIR) were employed for studies on structural properties. Size, shape and composition of the QDs were ascertained by SEM and EDS analyses. Results obtained from all the characterisations carried out enable them to be used as optically stable QDs for optoelectronic devices.

Keywords-Quantum dots; Hydrothermal; Optical properties.

### References-

1. One-pot synthesis of ternary CuInS<sub>2</sub> quantum dots with near-infrared fluorescence in aqueous solution. Siyu Liu, Hao Zhang, Yu Qiao and Xingguang Su, RSC Advances, 2012, 2, 819–825.
2. Preparation of fluorescent CdTe@CdS core-shell quantum dots using chemical free gamma irradiation method S.P. Raju, K. Hareesh, S. Chethan Pai, S.D. Dhole, Ganesh Sanjeev, Journal of Luminescence 192 (2017) 17–2
3. Electron irradiation effects on TGA-capped CdTe quantum dots Chethan Pai, S. MP Joshi, S. Raj Mohan, U P Deshpande, T S Dhama, Jayakrishna Khatei, KSKoteswar Rao and Ganesh Sanjeev, J. Phys. D: Appl. Phys. 46 (2013) 175304 (6pp).

## Improving the electrochemical properties of Mn<sub>3</sub>O<sub>4</sub> thin film electrodes through polyaniline coating

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**Abstract:** Mn<sub>3</sub>O<sub>4</sub> is a potential electrode material for electrochemical capacitors due to their earth abundance, low cost, and possible different oxidation states. In the current study, Mn<sub>3</sub>O<sub>4</sub> thin film electrodes were prepared using chemical spray pyrolysis technique and its surface was modified with polyaniline (PANI) coating to improve its electrochemical performance. X-ray diffraction (XRD) study revealed that PANI has been successfully coated on Mn<sub>3</sub>O<sub>4</sub> surface without affecting its structure. Moreover, Raman spectroscopic data supports the XRD findings. Scanning electron microscopic (SEM) images showed that the coating of PANI is uniform and cover the entire surface of Mn<sub>3</sub>O<sub>4</sub>. Further, the electrochemical properties of bare Mn<sub>3</sub>O<sub>4</sub> and PANI coated Mn<sub>3</sub>O<sub>4</sub> electrodes were analysed via cyclic voltammetry. An improvement in the storage performance was observed in the PANI coated Mn<sub>3</sub>O<sub>4</sub> electrode. The observed areal capacitance for PANI coated Mn<sub>3</sub>O<sub>4</sub> was 94 mF/cm<sup>2</sup> at 5mV/s, which was 1.5 times higher than the uncoated Mn<sub>3</sub>O<sub>4</sub> electrode. The above results suggest that PANI coating can effectively improve the electrochemical performance of Mn<sub>3</sub>O<sub>4</sub> electrodes, which can be suitable for supercapacitor application.

**Keywords:** Mn<sub>3</sub>O<sub>4</sub> ;PANI; Spray pyrolysis; Electrochemical capacitors.

### **References:**

1. Naiknaware AG, Chavan JU, Kaldate SH, Yadav AA (2019) Studies on spray deposited Ni doped Mn<sub>3</sub>O<sub>4</sub> electrodes for supercapacitor applications. *J Alloys Compd* 774:787–794. <https://doi.org/10.1016/j.jallcom.2018.10.001>
2. Durmus Z, Baykal A, Kavas H, Szeri H (2011) Preparation and characterization of polyaniline (PANI)Mn<sub>3</sub>O<sub>4</sub> nanocomposite. *Phys B Condens Matter* 406:1114–1120. <https://doi.org/10.1016/j.physb.2010.12.059>.

## INVESTIGATIONS ON THE STRUCTURAL, MAGNETIC, AND DIELECTRIC PROPERTIES OF Pr SUBSTITUTED BARIUM HEXAFERRITES

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**Abstract:** Pr substituted Barium hexaferrites,  $Ba_{(1-x)}Pr_{(x)}Fe_{12}O_{19}$ , ( $x=0-0.20$ ) were synthesized using ball milling followed by solid-state reaction route. Rietveld refinement of X-ray diffraction patterns of synthesized samples shows the formation of a single-phase magnetoplumbite structure, which belongs to the P63/mmc space group for all samples. Preferred orientation along the (008) plane was observed for Pr content  $x=0$ . Morphological studies using FESEM reveal the formation of a hexagonal plate-like structure. Grain size decreases significantly in Pr-doped samples due to the grain growth inhibition nature of Pr. This also explains the increased coercivity  $H_c$  of Pr-doped samples observed from magnetic property measurement. Magnetic measurements also show good  $M_s$  values for all the prepared samples. Dielectric spectroscopy reveals the Maxwell-Wagner type of polarization in all the prepared samples. AC conductivity follows the Jonsher power law.

**Keywords:** Barium hexaferrite; ball milling; Maxwell-Wagner type polarization

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## OPTICAL AND ELECTRICAL PROPERTIES OF GREEN SYNTHESIZED rGO/ZnO TRANSPARENT CONDUCTIVE ELECTRODE

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**Abstract:** Transparent Conductive Electrodes (TCEs) are important components in organic optoelectronic devices. ITO is the mostly applied TCE material, which is costly and inferior in mechanical performance. Recently, many new TCE materials are explored to overcome the deficiency of ITO, including graphene, ultrathin metal, and oxide-metal-oxide structure.

Here we try to prepare efficient and ecofriendly rGO/ZnO transparent conductive electrode. This is achieved by preparing Graphene oxide (GO) by using modified Hummer's method. The GO is reduced by Green fuel( Guava Fruit extract). The Zinc Oxide(ZnO) was prepared by using Gel combustion methods using same Green fuel. The rGO /ZnO nanocomposites were prepared by using Sonochemical method. Further, rGO/ZnO based transparent electrodes were prepared using simple Doctor Blade Technique. The prepared Samples were characterized and analyzed with different characterization techniques like X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy-dispersive X-ray spectroscopy (EDAX) and UV-Visible Spectroscopy (UV-Vis) .In order to study the effectiveness of rGO/ZnO electrode the Electrical Conductivity studied by using Two probe technique. The prepared rGO/ZnO electrode showed Transparency in the range 50- 60% , Electrical Conductivity in the order of  $10^{-7}$  S/m.

**Keywords:** Reduced Graphene Oxide, Zinc Oxide, Transparent Conductive Electrodes.

### References

- [1] D'Arco, A et al, Fabrication and spectroscopic characterization of graphene transparent electrodes Nanotechnology 2020, 31, 364006
- [2]Tiwari, S et al, Functionalized graphene as flexible electrodes for polymer photovoltaics. J. Alloys Compd. 2020, 825, 153954.

## Nanofluids Employing Functionalized Multi-Wall Carbon Nanotubes for Advanced Thermal Applications

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**Abstract:** Heating is a common issue faced by industries, automobiles, and electronic gadgets. To remove excess amount of heat, several methods are adopted out of which liquid circulation containing conventional fluids (water and ethylene) is one of best method. Owing to poor thermal conductivity of conventional fluids, nanofluids are developed after the discovery of nanomaterials. In present work, pristine multi-wall carbon nanotubes (F-MWCNTS) are successfully functionalized using an acid treatment approach. The F-MWCNTs are dispersed in milli Q water to prepare 5, 10, 20, and 30 wt% nanofluids. The functional groups are identified using Fourier transform infrared spectroscopy (FTIR), The morphology and elemental analysis of both P- and F-MWCNTs are carried out using field emission scanning electron microscopy (FESEM) with energy dispersive X-ray analysis (EDAX). The long-term stability of the prepared nanofluids is verified by measuring zeta potential, visual inspection, and UV-Visible spectroscopy. The suitability of the prepared nanofluids for heat transfer application is confirmed by measuring viscosity and thermal conductivity. The viscosity of the 10 wt% nanofluid is lower than that of the base fluid and has shown enhanced thermal conductivity of 22.14% as compared to base fluid (water), indicating its potential as an efficient nanofluid for heat transfer applications.

**Keywords:** F-MWCNTs; Nanofluids; Viscosity; Thermal conductivity; Zeta potential

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## Grafting of Polypyrrole onto Pullulan/ poly vinyl alcohol blend

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**Abstract:** The practical applications of the hygroscopic conducting polymer, polypyrrole (PPY), is limited due to poor processability resulting from brittleness and insolubility in common organic solvents. To address this issue, we employed a grafting technique to enhance its processability. The grafting process involved attaching polypyrrole (PPY) onto a blend of pullulan (PULL) and polyvinyl alcohol (PVA) using a chemical oxidative polymerization technique. The results, including various characterization techniques and density functional theory calculations to validate the grafting, are presented. Confirmation of functional structures and grafting was achieved through the interpretation of UV-Vis absorption spectrum, FTIR study, and validation by Hartree-Fock Density Functional Theory (HF-DFT) calculations.

The differential scanning calorimetry (DSC) data for all grafted polymers revealed glass transition temperature (T<sub>g</sub>) and crystalline melting point (T<sub>m</sub>) around 100°C and 250°C, respectively. Moreover, all grafted polymers exhibited good thermal stability. The XRD data confirmed the semicrystalline nature of the grafted samples. D.C. conductivity measurements, revealing the highest electrical conductivity of the films to be in the order of 10<sup>-5</sup> S/cm. FESEM images displayed a granular morphology. These graft films were utilized in constructing resistive-type humidity sensors, demonstrating a linear response of resistance to humidity with minimal hysteresis.

**Keywords:** Conducting polymer, Polypyrrole, Grafting, DFT

## ZnO-P(VDF-TrFE) Thin Films: Comprehensive Analysis of Structural, Optical, Thermal, Electrical, and Enhanced Ammonia Sensing Properties

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**Abstract:** An extensive study of ZnO-P(VDF-TrFE) thin films made by solvent casting is presented in this manuscript. The films are thoroughly characterized using a variety of techniques, revealing unique structural, spectral, optical, and electrical features. Surface morphology, roughness, and crystal structure are revealed by X-ray diffraction and field emission scanning electron microscopy. Bandgap energy and transmittance are two examples of optical parameters that are assessed using UV-Vis-NIR spectroscopy. FT-IR studies confirmed the presence of functional groups. Electrical properties are ascertained by the use of a source meter to measure current and voltage. Furthermore, ammonia-specific gas sensing behavior is evaluated. The films' diverse properties are demonstrated by the results, which show excellent ammonia sensitivity (with 5 wt% ZnO-doped films demonstrating 1100ppb sensitivity). The results highlight the potential of ZnO-P(VDF-TrFE) thin films in a variety of technical fields by providing insightful information on their many uses, especially as effective ammonia sensors.

**Keywords:** ZnO-P(VDF-TrFE) thin films, solvent casting, structural characterization, optical properties, ammonia sensing, multifunctional materials



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## Integrative Study of polymer blend (PVA / PVP) with ZnO nanoparticles

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**Abstract:** The study aims comprehensive investigation of structural, chemical and optical properties of ZnO nanoparticles incorporated with Polyvinyl Alcohol (PVA) and Polyvinyl Pyrrolidone (PVP) blend. ZnO nanoparticles are prepared by precipitation method and doped into PVA/PVP blend (50:50). The combination of X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) are employed to elucidate the structure as well as interactions within the polymer nanocomposite system. FTIR study validates the formation of a complex between the dopant and polymer blend where as XRD exhibits increase in the crystallization of doped polymer blend composites with increase in doping levels. Optoelectronic characterization of the material has been carried out using UV-Vis Spectroscopy and Spectrofluorometry. Reduction in the band gap and a simultaneous enhancement in optical parameters as a function of dopant concentration are observed in UV-Vis spectroscopy. Spectrofluorometry reveals enhancement of optical properties due to doping.

**Keywords-**nanoparticles, X-ray diffraction, UV-visible spectroscopy.

### References-

1. Synthesis, characterization and optical properties of hybrid PVA–ZnO nanocomposite: A composition dependent study, K.S. Hemalatha, K. Rukmani, N. Suriyamurthy, B.M. Nagabhushana, Materials Research Bulletin 51 (2014) 438 – 446.
2. Linear/Nonlinear Optical Characteristics of ZnO-Doped PVA/PVP Polymeric Films for Electronic and Optical Limiting Applications, Samer H. Zyoud, Thekayat H. Al Abdulaal , Ali Almoadi , Mohammed S. Alqahtani, Farid A. Harraz, Mohammad S. Al-Assiri, Ibrahim S. Yahia , Heba Y. Zahran, Mervat I. Mohammed and Mohamed Sh. Abdel-wahab, Crystals 2023, 13, 608.

## STRUCTURAL, MAGNETIC, AND ELASTIC PROPERTIES OF NANOCRYSTALLINE Y-SUBSTITUTED MAGNESIUM ZINC FERRITE

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**Abstract:** The present work is focused on the study of crystallinity of Magnesium Zinc Ferrite with yttrium doping. The structural, elastic and magnetic properties of Yttrium doped Magnesium  $Mg_{0.6}Zn_{0.4}Y_xFe_{2-x}O_4$  (with  $x=0.0, 0.1, 0.2$  and  $0.3$ ) ferrites were prepared by sol-gel method using sucrose as fuel. The structural parameters such average crystallite size, lattice constant, miller indices, interplanar distance, dislocation density, micro strain and x-ray density was made by analyzing x-ray diffraction data. Fourier transform infrared (FT-IR) data were used to calculate the elastic properties such as Young's modulus, Bulk modulus and Modulus of Rigidity of ferrites. The magnetic properties were studied by using vibration sample magnetometer (VSM).

**Keywords:** crystallite size, lattice constant, dislocation density, micro strain, x-ray density, elastic constants

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## Examining the Impact of Deposition Rate on Properties of Antimony Sulfide Thin Films and Applications.

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**Abstract:** Antimony trisulfide ( $\text{Sb}_2\text{S}_3$ ) has been recognized as a promising material for photo absorption owing to its high absorption coefficient, low toxicity, and natural abundance. However, the practical application of this material was limited by various stoichiometric and crystalline defects. In this study, a method was presented to produce highly crystalline  $\text{Sb}_2\text{S}_3$  thin films. The films were fabricated through thermal evaporation, with the deposition rate systematically varied, followed by annealing in a sulfur atmosphere at a controlled temperature of  $400^\circ\text{C}$ . A comprehensive examination of the fabricated  $\text{Sb}_2\text{S}_3$  thin films, using advanced techniques such as X-ray diffraction, Raman spectroscopy, scanning electron microscopy, and assessments of optical properties, highlighted their exceptional crystalline quality. The results from these analyses collectively confirmed the high degree of crystallinity achieved in the synthesized  $\text{Sb}_2\text{S}_3$  thin films. The thin films exhibited a notable reduction in both stoichiometric and crystal defects, concurrently demonstrating improved optical and morphological properties. UV-visible spectroscopy analysis revealed a marginal variation in the optical energy gap in the range of 1.6-1.7 eV due to the structural variation of the  $\text{Sb}_2\text{S}_3$  films caused by the deposition rate. Photoluminescence analysis provided insights into the defects and trap states. This meticulous fabrication process aimed to enhance the material's crystallinity and optimize its structural properties for improved performance in photonic applications.

**Keywords:** Antimony sulfide ( $\text{Sb}_2\text{S}_3$ ) thin film; Thermal Evaporation; Deposition rate; Thin Film Photonic applications.

**Reference:**

## The influence of $\text{Bi}_2\text{O}_3$ on the physical, optical, and gamma-ray shielding features of calcium-barium-borate glasses

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**Abstract:** A series of  $\text{Bi}_2\text{O}_3$  varying calcium-barium-borate glasses was prepared using the standard melt-quenching process. The composition of the glasses followed the formula  $(70-x)\text{B}_2\text{O}_3-15\text{CaO}-15\text{BaO}-x\text{Bi}_2\text{O}_3$ , where  $x = 0, 5, 10, 15$  and  $20$  mol%. The synthesized glasses were examined for the variation in physical, optical, and radiation shielding properties with the  $\text{Bi}_2\text{O}_3$  content. An increase in the concentration of  $\text{Bi}_2\text{O}_3$  leads to a corresponding increase in the density of the samples. The optical absorption spectra of the samples were obtained using a UV-Vis. spectrophotometer in the wavelength range of 200-1000 nm. Tauc's plot was employed to evaluate the optical band gap energy ( $E_g$ ) for all the samples. The results showed that  $E_g$  decreases with increase in  $\text{Bi}_2\text{O}_3$  content in the glasses. Moreover, the radiation shielding ability of the synthesized glasses was tested in terms of mass attenuation coefficient ( $\mu_m$ ), half value layer (HVL), mean free path (MFP), and effective atomic number ( $Z_{\text{eff}}$ ) using Phy-X/PSD software. The results show that the radiation shielding ability of the synthesized glass system increases as the  $\text{Bi}_2\text{O}_3$  content increases. Furthermore, the radiation shielding ability of the current glass systems was compared with that of some conventional shielding materials. Among all the samples prepared in this work, the glass with 20 mol% of  $\text{Bi}_2\text{O}_3$  emerges as a strong candidate for gamma-ray shielding. This can be attributed to its high mass attenuation coefficient ( $\mu_m$ ) and effective atomic number ( $Z_{\text{eff}}$ ), along with the lowest half-value layer (HVL) and mean free path (MFP).

**Keywords:** Bismuth-borate glasses; Density; Optical band gap; Radiation shielding.

## TUNING THE SO<sub>2</sub> SENSING BEHAVIOR OF Ti<sub>3</sub>C<sub>2</sub> MXene BY THE ANCHORING OF Ag NANOPARTICLES

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**Abstract:** As soon as graphene first came to light, two dimensional layered nanostructures have received tremendous interest among material scientists due to their suitability for diverse range of applications. The high surface to volume ratio and surface activities of these two-dimensional nanomaterials has laid path for their potential usage in room temperature operable sensor fabrication and has successfully surpassed the shortcomings of conventional sensors. Due to the versatile and tunable surface chemistry with metallic conductivity, the past decade has witnessed exponential rise in research articles on gas sensors based on MXenes. The present study focuses on the enhancement of sulphur dioxide (SO<sub>2</sub>) sensing characteristics of Ti<sub>3</sub>C<sub>2</sub> MXene by decorating Ag nanoparticles on the surface. Mild etching method using mixture of LiF and HCl is employed for the synthesis of Ti<sub>3</sub>C<sub>2</sub> MXene and its nanocomposite with Ag nanoparticles is synthesized via self-reduction technique. The structural, compositional, and morphological properties have been investigated using X-ray diffraction studies, Raman analysis, X-ray photoelectron spectroscopy and scanning and transmission electron microscopy respectively. The gas sensing measurements has depicted selective detection of SO<sub>2</sub> by the prepared MXene at room temperature. Further, enhanced response has been exhibited by the Ag-decorated Ti<sub>3</sub>C<sub>2</sub> MXene, thereby indicating the possibility of utilizing the fabricated room temperature operable sensor for real-life applications for monitoring hazardous SO<sub>2</sub> gas.

**Keywords:** Ti<sub>3</sub>C<sub>2</sub>; Room temperature; Ag nanoparticles; SO<sub>2</sub> sensing

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## Efficient Removal of Iron, Sulphate, and Nitrate from Water Using Fluorine-Substituted Chalcone Derivative

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**Abstract:** This study investigates the efficacy of a fluorine-substituted chalcone derivative for removing toxic metal contaminants, specifically iron, sulphate, and nitrate, from water. The chalcone derivative, (2Z)-1,3-bis(4-fluorophenyl)prop-2-en-1-one, is synthesized through the Schmidt condensation technique, using 4-fluoroacetophenone and 4-fluorobenzaldehyde. Fourier Transform Infrared spectroscopy (FTIR) confirms the presence of functional groups in the derivative. The removal efficiency of iron, sulphate, and nitrate is assessed by employing the fluorine-substituted chalcone derivative as a coagulant. Experimental parameters, such as pH and contact time, are systematically varied to determine their influence on the removal process. Results demonstrate the significant removal potential of the fluorine-substituted chalcone derivative for iron, sulphate, and nitrate, offering valuable insights into sustainable water treatment strategies. Chalcones, plant-derived polyphenolic compounds belonging to the flavonoid family, are known for their cytoprotective and modulatory functions. Our experiment, utilizing a chalcone prepared from 4-Fluorobenzaldehyde and 4-Fluoro Acetophenone, underscores its efficacy in removing toxic metals from water. Batch sorption studies reveal effective nitrate removal, reaching 93.65%, within a pH range of 6.5-8.5. This research contributes to the development of environmentally friendly solutions for toxic metal contaminant removal in water.

**Keywords:** fluorine-substituted chalcone derivative, water treatment, metal contaminants, removal efficiency, sustainable solutions, batch sorption studies

## STRUCTURAL AND THERMAL STUDIES ON PVA/PVP/Na-CMC TERNARY POLYMER BLEND CONTAINING TITANIUM OXIDE (TiO<sub>2</sub>) NANO-PARTICLES

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**Abstract:** In this work, we report a study on the synthesis and characterization of ternary polymer blends (PVA/PVP/Na-CMC, 50:25:25) loaded with metal oxide nano-fillers (TiO<sub>2</sub>) of varying concentration (0, 10, and 20 wt %). The synthesis was carried out by the conventional solution casting technique. The prepared samples were subjected to X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and Thermogravimetric analysis (TGA). XRD analysis provided information on the crystalline/amorphous phases of the pure blend and the polymer nano-composites (PNCs). The crystallite size of the PNCs was found to increase with increasing filler concentration. Fourier-transform infrared spectra, obtained in the range 400-4000 cm<sup>-1</sup>, elucidated the structural modifications of the ternary polymer blend caused by the incorporation of TiO<sub>2</sub>. Moreover, Thermogravimetric analysis (TGA) showed a significant improvement in the thermal stability of these PNCs indicating a homogeneous dispersion and good interaction of TiO<sub>2</sub> nano-particles with the polymer blend components.

**Keywords:** polymer nanocomposites; crystallite size; vibrational modes; degradation

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## EFFECT OF LITHIUM DOPING ON STRUCTURAL, OPTICAL, AND ELECTRICAL PROPERTIES OF ZINC - BORATE GLASSES CONTAINING Ag NANOPARTICLES

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**Abstract:** A novel series of zinc borate glasses was synthesized with the composition (75 - x) B<sub>2</sub>O<sub>3</sub>- 15ZnO - 8Na<sub>2</sub>O - 1V<sub>2</sub>O<sub>5</sub>- 1 AgCl - xLi<sub>2</sub>O, where x ranged from 0 to 20 mol%, using the conventional melt-quenching technique. X-ray diffraction studies confirmed the amorphous nature of the prepared glass samples. The glasses' physical properties such as density and molar volume were determined at room temperature by the application of Archimedes principle. Upon lithium doping, the glasses exhibited a range of densities, with values increasing from 2.4368 g/cm<sup>3</sup> to 2.6767 g/cm<sup>3</sup>. Simultaneously, the molar volume was found to decrease from 29.8054 cm<sup>3</sup>/mol to 24.1654 cm<sup>3</sup>/mol. Structural investigations of the glass samples were carried out through FTIR analysis. UV-Vis spectra of the glasses were obtained within the wavelength range of 200-1000 nm. Utilizing the absorption measurements Tauc's plots were generated, enabling the determination of both direct and indirect optical band gap energies, and Urbach energy. The direct band gap energy exhibited a range of 2.886 eV to 3.147 eV, while the indirect band gap energy varied from 2.730 eV to 3.064 eV for increasing lithium concentration. DC conductivity and activation energy were measured by using the standard two probe method. Among all the samples, the sample with 20 mol% lithium concentration showed a maximum Electrical conductivity. This study contributes to an understanding of the synthesis and characterization of lithium-doped Zinc-Borate glasses through the evaluation of their structural, optical, and electrical properties.

**Keywords:** Zinc-Borate glasses, FTIR studies, Optical band gaps, and DC Conductivity



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## FABRICATION OF THERMISTOR: INVESTIGATION OF PHYSICAL PROPERTIES OF TRANSITION METAL DOPED ZINC FERRITE AND THEIR APPLICATION AS THERMISTOR

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**Abstract:** The present work represents synthesis, dielectric properties, elastic properties, and application as Thermistor of transition metal doped  $ZnFe_2O_4$  ferrites. Co-precipitation technique was employed for the synthesis of pristine  $ZnFe_2O_4$  and nanocrystallites of three mixed ternary transition metal ferrite (MTTMF). The X-ray diffraction (XRD) analysis was employed to reveal the formation of a single-phase spinel structure of  $ZnFe_2O_4$ ,  $Mn_{0.5}Zn_{0.5}Fe_2O_4$ ,  $Co_{0.5}Zn_{0.5}Fe_2O_4$ ,  $Cu_{0.5}Zn_{0.5}Fe_2O_4$ . The elemental composition of the nanocomposites has been studied by SEM-EDS. The dielectric properties were investigated as a function of frequency at room temperature. Fourier transform infrared (FT-IR) data was used to calculate the elastic properties such as Young's modulus, Bulk modulus and Modulus of Rigidity of ferrites. The DC resistivity study gives the minimal activation energy at higher temperature region, determined from the slope of linear fit of the temperature-dependent curve indicating the semiconducting property of Ferrites. The temperature dependence of resistivity reveals thermistor parameters: sensitivity factor, activation energy which confirms a negative temperature co-efficient of resistance.

**Keywords:** Ferrites, Dielectric, NTC

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## Antibacterial activity of LaFeO<sub>3</sub>/Fe<sub>2</sub>O<sub>3</sub> nanocomposite synthesized via modified Sol-gel method

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**Abstract:** In the present work, pure nano Lanthanum ferrate (LaFeO<sub>3</sub>) and Lanthanum ferrate /Iron oxide (LaFeO<sub>3</sub>/Fe<sub>2</sub>O<sub>3</sub>) nanocomposite has been prepared by a modified sol-gel method using citric acid as a reducing agent. X-ray diffraction (XRD) analysis confirms that the prepared samples have pure phase. The optical band gap of the synthesized sample was investigated using diffuse reflectance spectroscopy (DRS). It was observed that the optical band gap of composite is less than that of the pure LaFeO<sub>3</sub>, and it falls in the visible region. The functional groups were identified using FTIR. The potency of the synthesized catalyst was investigated for antibacterial activity of both gram-positive and gram-negative bacteria by disc diffusion method using agar plates.

**Keywords:** LaFeO<sub>3</sub>; Nanocomposite; Sol-gel; Anti-bacterial activity.

### References:

#### Include the references

1. Vijayaraghavan, T.; Althaf, R.; Babu, P.; Parida, K. M.; Vadivel, S.; Ashok, A. M. Visible Light Active LaFeO<sub>3</sub> Nano Perovskite-RGO-NiO Composite for Efficient H<sub>2</sub> Evolution by Photocatalytic Water Splitting and Textile Dye Degradation. *Journal of Environmental Chemical Engineering* **2021**, 9 (1), 104675. <https://doi.org/10.1016/j.jece.2020.104675>.
2. Birben, N.; Lale, E.; Pelosato, R.; Uyguner Demirel, C.; Natali Sora, I.; Bekbolet, M. Photocatalytic Bactericidal Performance of LaFeO<sub>3</sub> under Solar Light: Kinetics, Spectroscopic and Mechanistic Evaluation. *Water* **2021**, 13 (9), 1135. <https://doi.org/10.3390/w13091135>.

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# Investigating the Optical, Thermal, and Nonlinear Properties of 1-(furan-2-yl)-3-(2,4,6-trimethoxyphenyl)prop-2-en-1-one: DFT and Experimental Insights

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**Abstract:** The optical, thermal, and nonlinear properties of 1-(furan-2-yl)-3-(2,4,6-trimethoxyphenyl)prop-2-en-1-one (FT2MP) are thoroughly investigated in this paper. The purity and dependability of the substance were guaranteed by employing high-quality reagents and the Claisen-Schmidt condensation process to synthesize it. UV-Vis-NIR spectra, photoluminescence, thermal behavior (TGA-DTA and DSC), and spectral characteristics (FTIR and FT-Raman) were all included in the experimental analysis. Density functional theory (DFT) simulations offered a theoretical knowledge while X-ray diffraction (XRD) research revealed structural information. The synthesized compound's results showed unique optical features, thermal stability, and substantial nonlinear properties. Its absorption behavior was confirmed by UV-Vis-NIR spectra, and its emission characteristics were shown by photoluminescence studies. Its stability was underlined by thermal analysis, which also offered possible thermal management applications. Molecular vibrations had been confirmed by spectral analysis, and the purity and structure of the crystals were verified by XRD. DFT theoretical simulations provided insights on the nonlinear optical properties, the HOMO-LUMO energy gap, and the optimal geometry. The consistency of the experimental and theoretical findings verifies their accuracy and dependability. This research advances our

knowledge of the optical, thermal, and nonlinear characteristics of FT2MP and creates new opportunities for its prospective use in optical and nonlinear devices.

**Keywords:** FT2MP, Density Functional Theory (DFT), Optical Properties, Thermal Behavior, Nonlinear Properties, Experimental Insights, Claisen-Schmidt Condensation

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## Characterization of 1-(furan-2-yl)-3-(3,4,5-trimethoxyphenyl)prop-2-en-1-One: A comprehensive study of its optical, thermal, and nonlinear properties

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**Abstract:** This study thoroughly examines the optical, thermal, and nonlinear properties of 1-(furan-2-yl)-3-(3,4,5-trimethoxyphenyl)prop-2-en-1-one (FT3MP). A meticulous application of the Claisen-Schmidt condensation process ensured exceptional purity and dependability during the compound's production. Photoluminescence analysis was used to identify the properties of the emission, and UV-Vis-NIR spectra were used to evaluate the absorption profile. Stability was emphasized by thermal analysis, indicating possible uses for thermal management software. Spectral analysis verified the existence of molecular vibrations, whereas XRD verified the crystals' purity and structure. Density Functional Theory (DFT) theoretical calculations have yielded valuable insights into optimizing the nonlinear optical properties, geometry, and HOMO-LUMO energy gap. The excellent match between theoretical and experimental results confirms the validity and accuracy of the findings. With novel applications in optical and nonlinear devices, this study greatly advances our understanding of the optical, thermal, and nonlinear properties of FT3MP. The experimental examination included photoluminescence, UV-Vis-NIR spectroscopy, and spectrum analyses (FTIR). Furthermore, theoretical understanding was advanced by Density Functional Theory (DFT) simulations, and structural insights were critical from X-ray diffraction (XRD). The intriguing optical characteristics, exceptional thermal stability, and superior

reduction demonstrated by the results highlight the promise of FT3MP in a variety of applications.

Keywords: FT3MP, Claisen-Schmidt condensation, photoluminescence, UV-Vis-NIR spectra, thermal analysis, DFT simulations, X-ray diffraction.

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## GAMMA RAY IRRADIATION AND MAGNETIC FIELD EFFECT ON DROSOPHILA MELANOGASTER FLIES

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**Abstract:** The cultured flies were taken to gamma ray irradiation chamber and the duration of absorbed dose was set-ted to 6,12,18,24, and 36 hours. The gamma radiation absorbed dose range for Drosophila melanogaster male flies 28.96 nGy to 25.428 nGy. And the gamma radiation absorbed dose range for Drosophila melanogaster female flies 17.144 nGy to 15.053 nGy. And each set of trials as same range of absorbed dose but different timing in hours. One day old 20 flies were taken from a culture passed to gamma radiation treatment chamber it was prepared by using thin glass sheet, and allowed to exposure of flies to radiation. After 48 hours it shows the 50% of the lethality in flies. Based on this information experiment was setup for different duration within 48 hours. The activity of Drosophila can be influenced by radiation doses due to the impact on their DNA. Low doses of radiation with long term exposure can cause mutations, affecting the fly's development, behavior, and overall physiology. The flies from the parental culture were taken to magnetic field exposure in this case duration of exposing is constant as 6 hour. And flies were made 3 groups and each group labeled as M1, M2 and M3 and these are exposed to 1K, 2K and 3K gauss magnetic field. Treated flies were transferred to culture media. From this culture one day old and first generation flies were taken to further analysis. Exposing Drosophila melanogaster flies to magnetic fields of varying strengths (1KGauss, 2KGauss, and 3KGauss) lead to activity changes due to the influence of magnetic fields on their biological processes. The comprehensive investigation into the effects of gamma irradiation and magnetic field effect on Drosophila melanogaster flies has study revealed notable alterations in various physiological parameters, including reproductive capabilities, motional activity, growth rate measurement, weight measurement, life span measurement and overall health.

**Keywords:** Drosophila melanogaster flies, Gamma irradiation, Magnetic field, and physiological parameters.

## Photoluminescence properties of Cations ( $\text{Na}^+$ , $\text{Mg}^{2+}$ , $\text{Bi}^{3+}$ ) Co-doped $\text{ZnAl}_2\text{O}_4:\text{Sm}^{3+}$ phosphors for LED Applications.

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**Abstract:** A series of  $\text{ZnAl}_2\text{O}_4:\text{Sm}^{3+}$  ( $x=1-11$  mol%) phosphors were synthesized by nitrate-citrate gel combustion method at an optimum temperature of  $900^\circ\text{C}$ . The co-doped  $\text{ZnAl}_2\text{O}_4: x\%\text{Sm}^{3+}$ ,  $\text{A}^{n+}$  ( $x=5$  mol%,  $\text{A}^{n+} = \text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Bi}^{3+}$ ,  $n=1,2,3$ ) phosphors were developed. Powder X-ray diffraction (PXRD), diffuse reflectance spectra (DRS), FTIR, FESEM with EDS, HRTEM with SAED and PL characterization techniques were used to characterize properties of pristine and doped  $\text{ZnAl}_2\text{O}_4:\text{Sm}^{3+}$  ( $x=1-11$  mol%) phosphors. The PXRD patterns of  $\text{ZnAl}_2\text{O}_4: \text{Sm}^{3+}$  phosphors were crystallized in a cubic phase,  $Fd-3m$  space group. The XPS survey scan of the sample  $\text{ZnAl}_2\text{O}_4:\text{Sm}^{3+}$  (5 mol%) confirms the presence of the elements Zn, Al, O and Sm. The photoluminescence of  $\text{ZnAl}_2\text{O}_4: x\%\text{Sm}^{3+}$  ( $x=5$  mol%) has a major emission peak when excited at 265 nm and 404 nm excitations. PL Spectra of co-doped  $\text{ZnAl}_2\text{O}_4: x\%\text{Sm}^{3+}$ ,  $\text{A}^{n+}$  ( $x=5$  mol%,  $\text{A}^{n+} = \text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Bi}^{3+}$ ,  $n=1,2,3$ ) phosphors excited at 265 nm shows the maximum emission of  $\text{ZnAl}_2\text{O}_4: x\%\text{Sm}^{3+}$  ( $x=5$  mol%) phosphor for co-doped with cation  $\text{Mg}^{2+}$  among the series. The PL intensity enhancement and the CIE chromaticity coordinates for the  $\text{ZnAl}_2\text{O}_4:\text{Sm}^{3+}$  phosphors indicate that  $\text{Sm}^{3+}$  doped  $\text{ZnAl}_2\text{O}_4$  could be employed as a potential orange red-emitting phosphor for LED applications.

**Keywords:** Orange-red Phosphor, nitrate-citrate gel combustion, Cubic phase, Photoluminescence, Chromaticity Coordinates.



## Malic acid modified gold nanoparticles in selective lead detection

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**Abstract:** Heavy metals such as Arsenic (As), Cadmium (Cd), Lead (Pb), and Mercury (Hg) are conventionally detected using various techniques such as inductively coupled- plasma mass spectrometry (ICP- MS), atomic absorption spectrometry (AAS) [1] [2]. They show certain drawbacks, such as multiple sample preparation steps and sophisticated instruments [3]. Colorimetry-based detection involves a change in the color of the solution, which results from chemical interactions between the heavy metals and chemical reagents. The presence or absence of heavy metals is indicated by the color change [4]. In this study, we have used malic acid (MA) to modify the surface of gold nanoparticles (AuNPs) for selective detection of Pb [4]. The solution containing MA-AuNPs displayed a specific signal at 536 nm, which is characteristic of AuNPs. In the presence of heavy metal ions, the AuNP-MA solution exhibited a noticeable shift in color from pink to blue. At pH 8 of AuNP- MA, only Pb of concentration 1 ppb exhibited a peak in the range of 700- 800 nm. Hence, MA- AuNPs can be employed in detecting Pb below its permissible amount.

**Keywords:** Heavy metals, gold nanoparticles, malic acid, absorbance

### References

- 1) Koop, S. H. A.; Van Leeuwen, C. The Challenges of Water, Waste and Climate Change in Cities. *Environment, Development and Sustainability* 2016, 19 (2), 385–418. <https://doi.org/10.1007/s10668-016-9760-4>.
- 2) Narukawa, T.; Iwai, T.; Chiba, K. Simultaneous Speciation Analysis of Inorganic Arsenic and Methylmercury in Edible Oil by High-Performance Liquid Chromatography–Inductively Coupled Plasma Mass Spectrometry. *Talanta* 2020, 210, 120646. <https://doi.org/10.1016/j.talanta.2019.120646>.
- 3) Sheth, D. B.; Gratzl, M. Differential Linear Scan Voltammetry: Analytical Performance in Comparison with Pulsed Voltammetry Techniques. *Analytical and Bioanalytical Chemistry* 2013. <https://doi.org/10.1007/s00216-013-6979-x>.
- 4) Ratnarathorn, N.; Chailapakul, O.; Dungchai, W. Highly Sensitive Colorimetric Detection of Lead Using Maleic Acid Functionalized Gold Nanoparticles. *Talanta* 2015, 132, 613–618. <https://doi.org/10.1016/j.talanta.2014.10.024>.

## Revolutionizing Semiconductor Storage: Multi-Paired Page Flash Memory Architecture

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**Abstract:** A revolutionary step forward in semiconductor devices is the architecture of multi-paired page flash memory. Conventional single-page designs are transformed by this innovative arrangement, which arranges memory cells into paired structures to facilitate concurrent processes. The advent of multi-paired pages has dramatically altered flash memory arrays by allowing for more efficient data transport and lower power consumption. The paper elucidates the symbiotic link between blocks and planes and the pioneering structural complexity within multi-paired pages. Innovative solutions, such as custom wear leveling and error correction algorithms, are necessary to resolve the unique problems caused by this novel design, including optimization challenges and interference consequences. To set the stage for innovative research, this abstract advocates for group investigations into the unexplored territory of multi-paired page designs. This finding heralds a new era in semiconductor devices and highlights the revolutionary possibilities of these arrangements. Its goal is to redefine performance and efficiency standards in semiconductor-based storage solutions by encouraging innovative research that will reveal hitherto unrealized potential.

**Keywords:** Flash Memory Arrays; Multi-Paired Pages; Semiconductor Storage; Data Efficiency

### References:

1. Lee, S., Kim, D. and Ha, J. (2016) 'A paired-page reading scheme for NAND flash memory', *2016 International Conference on Information and Communication Technology Convergence (ICTC)* [Preprint]. doi:10.1109/ictc.2016.7763369.
2. Han, S. *et al.* (2023) 'Page type-aware data migration technique for read disturb management of NAND flash memory', *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, 31(4), pp. 591–595. doi:10.1109/tvlsi.2023.3240172.
3. Park, J.K. and Kim, S.E. (2022) 'A review of cell operation algorithm for 3D NAND flash memory', *Applied Sciences*, 12(21), p. 10697. doi:10.3390/app122110697.
4. Kim, Y., Jin, H., Kim, D., Ha, P., Park, M., Hwang, J., Lee, J., Woo, J., Choi, J., Lee, C., Kwak, J. Y., & Son, H. (2022). Design of Synaptic Driving Circuit for TFT eFlash-Based Processing-In-Memory Hardware Using Hybrid Bonding. *Electronics*, 12(3), 678. [doi.org/10.3390/electronics12030678](https://doi.org/10.3390/electronics12030678)

