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BIOSYNTHESIS OF ZINC OXIDE USING BANANA LEAVES: STRUCTURAL AND OPTICAL CHARACTERIZATION REVIEWS

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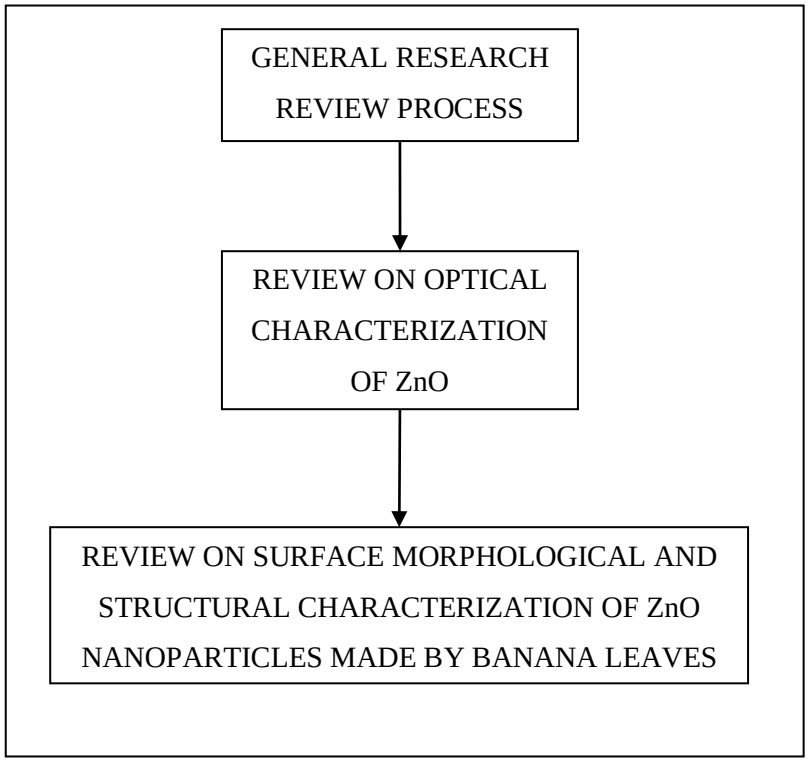
Abstract:
Nanotechnology as call as nanomaterials is the wide scope of study and application of extremely nano in size can be used related to all the other science fields. Zinc Oxide (ZnO) material notify that it is valuable material in terms of properties, criteria, applications and mechanisms. The characterization of ZnONPs has been studied by using a few instruments to identify a kind of parameters. There are UV-Vis, FT-IR, XRD, FT- Raman, Photoluminescence (PL) and SEM are used. The biosynthesis of NPs ZnO use is much better and affordable because the process provide more eco-friendly, economical, free toxic, and easy to compose rather than chemical and physical methods. The objective of this study is to sort-out the best biological or green synthesis by using bananas leaves for fabrication the high quality of ZnONPs and to report the past, current and latest of structural and optical properties of ZnO using banana leaves. The process of preparation of ZnONPs is the preparation of the banana leaves extract, synthesis and purification and characterization of optical, structural and surface morphology. The best technique for growth ZnONPs using banana leaves extraction is by using zinc nitrate hexahydrate solution as metal precursor. The surface morphological of ZnONPs was obtained by SEM. The analysis review shows that crystal shape of the ZnONPs was in spherical, hexagonal structure and agglomerate nanocrystallite. Next, XRD analysis review shows the purity and particles size of ZnONPs. The crystallinity of the nanoparticles depends on the temperature behaviour. Furthermore, PL spectroscopy analysis review is obtained for inspects optical property from the peak intensity. A few chemical functional groups are identified by using FTIR and FT-Raman spectroscopy analysis review where ZnONPs by using banana leaves extract consist of bioactive compounds. The size of a crystalline particle change which increases or decreases some of the phonons or vibrational modes due to volume of the particle ZnONPs.

***Keywords*:**
nanotechnology, zinc oxide, biosynthesis, banana leaf, characterization

Objectives:

- To sort-out, the best biological or green synthesis by using bananas leaves for fabricating the high quality of ZnO nanoparticles.
- To report the past, current and latest of structural and optical properties of ZnO using banana leaves.

Methodology:



Result:

This paper is about surface morphology, structural and optical characterization of zinc oxide nanoparticles by using banana leaves extract. Their characterizations are essential for this study to achieve high quality zinc oxide nanoparticles by using plant extraction. A few equipment are needed to identify and investigate zinc oxide nanoparticles such as scanning electron microscopy (SEM), x-ray diffraction (XRD), FT-Raman Spectroscopy, UV-Vis, FTIR and photoluminescence (PL) Spectroscopy according to the previous study.

- ***Optical Properties Study Reviews:***

  According to A. Narayan, the optical properties of green synthesized ZnONPs by using banana leaves extract measured by UV-Visible spectroscopy. UV-visible absorption spectroscopy is recently used as one of the techniques to investigate the optical properties of the nanoscale size of particles. The absorption peak from the UV-vis demonstrating the presence of ZnONPs. The researcher has obtained a strong absorption spectrum of ZnONPs band at about 355 nm corresponding to the characteristic bandgap of this white powder material. Besides, there is no other peaks observed in the spectrum, which confirms that the synthesized product is only ZnONPs. The reflectance spectra which is increased or decreased depends on the electron transitions occurring in the optical band gap due to oxygen and zinc vacancies. Furthermore, the concentration of extract has its role where it affects to the PL intensity due to Zn vacancies and O vacancies. This is because zinc oxide nanoparticle strongly absorbs ultra violet light and the characteristic of this material is photoconductive. With that, PL spectroscopy and UV-Vis analysis review are obtained for inspects optical property from the peak intensity.

- ***Surface Morphology Study Reviews:***
  The surface morphology of zinc oxide nanoparticles is determined by using scanning electron microscopy (SEM). The surface morphology structure is obtained in irregular shapes and confirms the existing ZnONPs by detected single bond strongest which is oxygen and hydrogen bond refer to the researcher. In general, the image reveals that most of the ZnONPs have a crystal structure where in spherical shape and agglomerate arrangement nanocrystallite. The size and shape of this nanomaterials depend on the time-dependent nucleation and growth. In other words, the large specific surface area and high surface energy of the particles also influence the formation of the ZnONPs.

- ***Structural Properties Study Reviews:***
  The structural properties of the white powder sample of ZnONPs functional groups were analyzed by using Fourier Transform Infrared Spectroscopy (FTIR). This equipment analysis provide a data according to the vibrational and rotational of movement of a particle in a medium space. According to A. Narayan, this method will be recognizable proof and characterization of a ZnONPs totally due to absorption fingerprint region. A few chemical functional groups identify more than 1000 cm-1 absorption fingerprint region such as O-H bending, double bond C=C with asymmetric stretch and triple bond C≡C symmetry which reduces the intensity from the researcher. The researcher also identifies the presence of ZnONPs at absorption fingerprint region below than 1000 cm-1 is at 874 cm-1 to the Zn–O vibration mode. In another review study by using XRD, the structure of ZnONPs is hexagonal wurtzite and cubic zinc blende according to the diffraction pattern. The ZnONPs structure (hexagonal wurtzite) is most stable at ambient conditions or room temperature and purity of this substance is fully identified. In additions, FT-Raman basically for chemical identification of molecular structure in this review study. The analysis review state that the size of a crystalline particle change which is increases or decreases some of the phonons or vibrational modes due to volume of the particle. The atoms in the lattice can vibrate in relation to each other like ZnONPs which has a wurtzite structure.

Conclusion:

The purpose of the research was to review synthesis ZnO nanoparticles by using a biological method as call as biosynthesis or green synthesis by using banana leaves extract with kind of techniques to structural properties, optical properties and surface morphology characterizations. The best technique for growth ZnONPs using banana leaves extraction is by using zinc nitrate hexahydrate solution as a metal precursor. By using a good metal precursor will produced high quality ZnO nanoparticles production and plant extract as stabilizing and capping agent properties as well. The surface morphology of ZnO nanoparticles by using banana leaves extract is obtained by SEM analysis review that shows crystal shape in spherical, hexagonal structure and agglomerate nanocrystallite. Next, XRD analysis review shows the purity and particles size of ZnO nanoparticles. PL spectroscopy analysis review is obtained for inspects optical property from the peak intensity. Last but not least, FT-Raman and FTIR basically for chemical identification of molecular structure in this review study where bioactive compounds and ZnO nanoparticles are identified.