SYNTHESIS AND CHARACTERIZATION OF NI-MN NANO COMPOSITES USING SESAMUM INDICUM AS REAGENT

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ABSTRACT:

A simple and efficient method of Synthesis and characterization of Ni-MnNanocomposites using Sesamum Indicum which has various applications like antioxidant activity in blood, anticancer activities were carried out by green synthesis method. The resultant composites were characterized by X-Ray Diffraction (XRD). XRD confirmed that the prepared nanocomposites as Ni-Mn and the particle size of Ni-Mn composites was found to be 39 nm respectively. Modern technological world demands a variety of multifunctional materials with desirable mechanical, thermal, electrical and chemical properties for specialized applications. Composites is a class of materials which present rich possibilities for the development of such multifunctional novel materials desired to new technological advancements.The current nanotechnology has received much attention towards nanocomposites materials due to their unique combination of properties superior to conventional composite materials. The absence of impurity peaks denotes the high crystalline nature of the composite material.

KEYWORDS: Synthesis and characterization, Sesamumindicum aqueous extract, Ni-Mnnanocomposites.

INTRODUCTION:

Today by an improvement of science and technological inputs and civilization for the industrial development is decided by the evolution of new, progressively technological conveniences accompanied by environmental crisis and public life limits.Enlargement of new materials may lead us to further useful and effective application of the finite resources we have in our hand as well as expose to best future we dream of today.Nanotechnology will eventually provide us with the ability to design custom-made materials and products with new enhanced properties, new nano

electronics components, new types of "smart" medicines and sensors, and even interfaces between electronics and biological systems [1].

Composites:

Composite materials, formed through combining two chemically or physically different materials can provide a desired set of properties which could be optimized to achieve the specific requirements. This material is a multiphase which is formed by combination of two or more distinct semiconducting materials, having enriched bulk properties considerably differentfrom any of the counterparts.

Classification of composites:

Composites can be broadly classified as follows:

- Based on nature of matrix phase
- Based on surface of dispersed phase
- Based on size of dispersed phase

Nanocomposites:

The current nanotechnology has received much attention towards nanocomposites materials due to their unique combination of properties superior to conventional composite materials. Nanocomposites are the composite materials in which at least one dimension of the dispersed phase is in the nanometre range. Nanocomposite material delivers an exclusive set of admirable properties which makes them multifunctional due to their large surface area to volume ratio of the nanoscale dispersed phase or nanofiller.

Nanocomposites show major advantages over conventional composites such as:

- Lighter weight due to low filler loading
- Low cost due to lower amount of filler use
- High mechanical strength
- High thermal stability
- Flame retardancy [2].

Green Nanocomposites:

A composite with at least one biodegradable component is known as a green composite. In other words, matrix or reinforcement or both may be biodegradable. There are many biodegradable matrix materials which are widely used. Examples, Starch, CelluloseSoy protein isolate and Wheat protein isolate.

Green Nanoscience:

Green chemistry and Nano science are both emerging fields that take advantage of molecular-level designing and have enormous potential for advancing our science. Nano science is the study of materials that are on the length scale of 100 nanometres or smaller and have properties that are dependent on their physical size. The principles of green chemistry can guide responsible development of nano science, while the new strategies of nanoscience can fuel the development of greener products and processes.In recent years, green synthesis of metal nanoparticles is an interesting issue of the nanoscience.The numbers of applications of nanocomposites have been growing at a rapid rate.More general applications currently being considered include usage as impellers and blades for vacuum cleaners, power tool housings, mower hood and covers for portable electronic equipment such mobile phones [3].

Herein we have synthesised Ni-MnNanocomposites mediated by sesamumindicum for Bio-medical purposes.

MATERIALS AND METHODS:

Materials: Nickel chloride, Manganese chloride, Sesamumindicum.

Methods:

Sesamumindicum aqueous extract: In order to get the Sesamumindicum aqueous extract,the sesame seeds are crushed.4g of crushed Sesamumindicum seeds which is mixed with 100ml of deionized water and it is heated to about 80◦ C for 45 mins.

Ni-Mnnanocomposites using sesame aqueous extract:

The extract is doubly filtered with the sieve and followed by Whatman filter paper No.1.Add 25ml of the Sesame indicum extract in a beaker. Add 1 M of $Nicl_2$ and $Mncl_2$ into the beaker.It is then stirred at room temperature about 3 hours.The pH value of the solution is maintained at 11 by dropwise addition of KOH.The solution was subjected to 30 mins of sonication process using a ultrasonicator with 40 KHz frequency with input power of 350 W. Then the sample is thoroughly rinsed with double distilled water around 5 times. The precipitate is filtered and dried in hot air oven at 600◦C for 10 hours.The sample is annealed at 7500 ◦C for 8 hours.Black colour Ni-Mnnanocomposite is obtained.

RESULTS AND DISCUSSIONS:

Characterization using XRD:

The structural characterization of the Ni – Mnnanocomposites are carried out by the XRD method. The x-ray diffraction experiments are carried out with the XPERTPRO

diffraction system using the Cu Kα radiation of wavelength 1.5406A°. The type of the scan used is continuous and range from 10° to 80°. The average grain size is calculated using the Debye Scherrer formula,

$D=K\lambda/\beta\cos\theta$ (m)

where,

- D is the gain size or particle size (nm)
- β is the full width at half maximum (FWHM) of a broad diffraction peak
- λ is the X-ray wavelength (1.5406 Å)
- θ is the Bragg's angle (degree)
- K is the Scherrer constant (0.9)

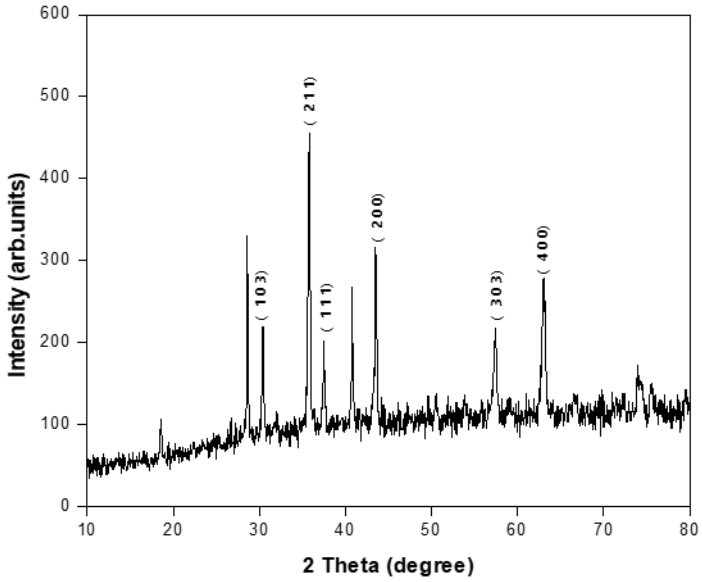

Figure 1:XRD pattern of Ni – Mnnanocomposites.

The XRD results for the Ni – Mnnanocomposites exhibit strong peaks around 2θ =37.50° along (1 1 1) plane, 2θ =43.36° along (2 0 0) plane which belongs to Nickel and 2θ =30.40° along (1 0 3) plane, 2θ =35.78° along (2 1 1) plane, 2θ =63.00° along (4 0 0) plane, 2θ =57.39° along (3 0 3) plane and 2θ =74.18° along (4 1 3) plane which belongs to Manganese. This indicates clearly the formation of Ni – Mnnanocomposites. The peaks values are in good agreement with the JCPDS cards. The absence of impurity peaks denotes the high crystalline nature of the composite material. The average crystalline size of the particle is 39nm which is calculated using Debye Scherrer formula.

CONCLUSION:

In the present scenario nanotechnology is playing an important role in all fields of science and technology. Nanoparticle synthesis via green and ecofriendly route is safer and good alternative to the conventional methods. Hence synthesis and characterization of Ni -Mnnanocomposites using Sesamum Indium extract as capping or stabilizing agents has been carried out and the results of the study are incorporated in the present paper.

Ni -Mnnanocomposites were successfully synthesized from $NiCl_2$ and $Mncl_2$ using Sesamum Indium extract as capping/stabilizing agent. The particles obtained were analysed by XRD for the confirmation of the particles. The particle size is found to be approximately 39 nm by XRD analysis. They are found to be crystalline in structure.The plant species (extracts of various parts of the plant) served as capping or stabilizing agent and it is possible because plant extract perform an effective protection and prevent aggregation of particles. The results suggested that green plants provided the formation of more stable nanoparticles. The synthesis is carried out at room temperature and in aqueous conditions without addition any chemical reagent as capping / stabilizing agent and therefore it is to be considered as a green and ecofriendly process, reliable and economic method of synthesis of Ni-Mnnanocomposites.

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