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History of nanoparticles in India and synthesis of Mg doped ZnO DMS nanoparticles and it's characterisation

PRATIK BHANUSE

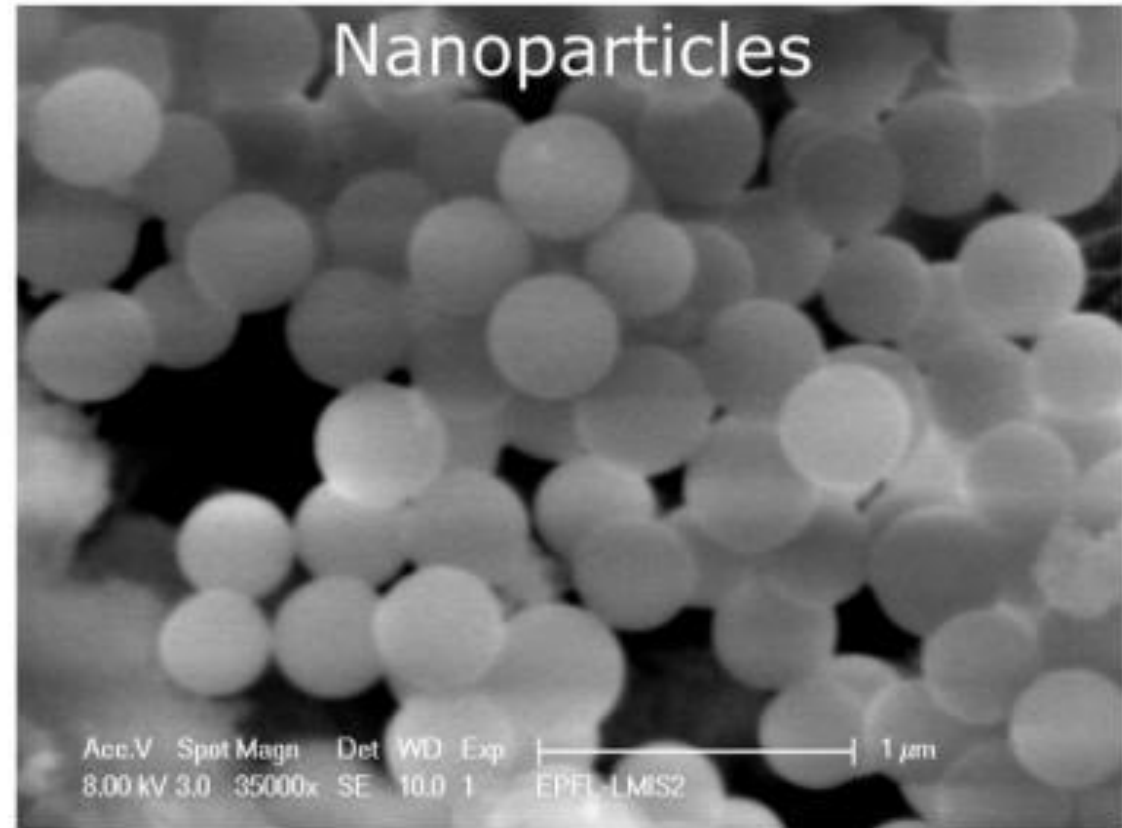
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Content Layout

- Introduction
- History of nanoparticles in India
- Description of Mg doped ZnO DMS
- Characterisation of the compound
- Interesting results

WHAT ARE NANOPARTICLES ?

- Size range 1-100nm.
- Small particle which behaves as a whole unit (technical definition).



Source: <http://phys.org/news/2008-09-pyrex-nanoparticle.html>

What is the significance and application of nanoparticles?

- ▶ Small size - hits the target more efficiently.
- ▶ Thermal Stability – use in different temperatures.
- ▶ Wide use in medical science and engineering applications.
- ▶ Military applications – Tracking.
- ▶ Promising field of research.

History of Nanoparticles in India

- ▶ Food
- ▶ Utensils
- ▶ Tilak
- ▶ Herbal Medicine and Charanamrit

Food

- ▶ What are the uses of Spices ?
 - Colour
 - Flavour
 - Medicinal benefits
 - Spices in food help to recover minor bruises



Few spices and their
medicinal properties...

CHILLI POWDER

- Rich in Vitamin A and C.
- Strengthens immune system.
- Nice spicy taste (Obviously!)



Source: <http://www.supraorganics.com/organic-red-chilli.php>

CLOVE

- Anti-oxidant
- Anti-inflammatory – used when toothache.
- Cures sour throat due to inbuilt heat.



Source: <http://flusterbuster.com/2013/07/cloves-39-uses-wwii-series.html>

GINGER

- Reduces pain and swelling in arthritis patients.
- The acidic level in tea is increased due to caffeine.
- Used in Masala Chai (Tea) to reduce acidity.



Source: <http://sites.udel.edu/bhan/2015/12/16/decembers-ingredient-of-the-month-ginger/>

Utensils

- ▶ Use of Copper plates and glass.
- ▶ Use of gold and silver metal plates
- ▶ Also, Wooden, earthen and leaf.



Why do Indians eat in these
utensils???

GOLD AND SILVER

- Improves Eye sight
- Anti-bacterial action
- Boost immunity
- Cools down the body



Source:
<http://www.goldplatedidols.com/kamadhenu-gold-coated.html>



Source:
<http://krishnasilver.tradeindia.com/silver-plated-dinner-set-1151705.html>

LEAF

- Increases appetite
- Eco-friendly
- Chemical free
- Wax coating enables the food to produce a lovely aroma after pouring it on the leaf



Source: <https://rhema3one7.com/2012/10/09/my-art-of-food-photography-part-1/>

COPPER

- Anti-oxidant, Anti-carcinogenic.
- Maintains pH level in body
- Regulates body fats
- Produces “Melanin” to prevent sun burn and white patches on body.
- Prevents ulcer, skin diseases, respiratory disorders, internal wounds, etc.



Source: <http://www.sagasteels.com/copper-steel-dinner-set-1782375.html>

TILAK

- ▶ A mark on the forehead, right in the middle of eyebrows.
- ▶ But scientifically different types of tilak have different purpose.

TILAK

- Different part of India has different style.
- Human body emits electromagnetic waves(EM).
- Tilak enhances the activation of EM waves.
- To reduce stress, tension and headache.
- The paste has internal heating and cooling properties.



Source:
<https://en.wikipedia.org/wiki/Tilaka>

TILAK

- Married women apply “Sindoor” (Tilak) on the forehead along the part-line of a woman hair.
- It is not very easy to hypnotize a person who has applied Tilak.



Source:

<http://darbarindianwedding.esy.es/category/uncategorized/>



Herbal Medicine and Charnamrit

- ▶ There are several herbal medicines like Tulsi (basil), colves, Turmeric, etc.
- ▶ Turmeric is one the most important medicine.



TURMERIC PATENT WAR 1995

- In 1995, researchers at University of Mississippi claimed,

“ABSTRACT: Method of promoting healing of a wound by administering turmeric to a patient afflicted with the wound”.

- Challenged by Dr. Raghunath Mashelkar (FRS., former director CSIR).

United States Patent [19]

Das et al.



US005401504A

[11] Patent Number: 5,401,504

[45] Date of Patent: Mar. 28, 1995

[54] USE OF TURMERIC IN WOUND HEALING

[75] Inventors: Suman K. Das; Hari Har P. Cohly, both of Jackson, Miss.

[73] Assignee: University of Mississippi Medical Center, Jackson, Miss.

[21] Appl. No.: 174,363

[22] Filed: Dec. 28, 1993

[51] Int. Cl.⁶ A61K 35/78

[52] U.S. Cl. 424/195.1; 514/925; 514/926; 514/927; 514/928

[58] Field of Search 424/195.1

[56] References Cited

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Kumar et al GA.119: 871K (1993) of Ind. Vet. J. 70(1):42-4 (1993).

Abstracts of Charles et al Trop. Geogr. Med: 44(1-2) 178-181 Jan. 1992; Rafatullah et al J. Ethnopharmacol. 29(1): 25-34 Apr. 1990; Kutton et al Tumori 73(1): 29-31 Feb. 28, 1987; Mehra et al. Tokai J Etpharm Med 9(1): 27-31 Mar. 1984.

Primary Examiner—Shep K. Rose

Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] ABSTRACT

Method of promoting healing of a wound by administering turmeric to a patient afflicted with the wound.

6 Claims, No Drawings

Source:
<https://docs.google.com/viewer?url=patentimages.storage.googleapis.com/pdfs/US5401504.pdf>



CHARNAMRIT

- *Charan* means legs,
amrit means nectar.



Magnesium(Mg) doped Zinc Oxide(ZnO) Dilute magnetic Semiconductor (DMS)

- ▶ The study was done to understand the change in magnetic properties and size variation according to the proportion of Mg.
- ▶ The study was done for the 1%, 3% and 5% of Mg in ZnO.
- ▶ The characterisation was done using X-ray diffraction(XRD), Scanning electron microscope(SEM) and Superconducting Quantum Interference Device (SQUID).

Characterisation of compound

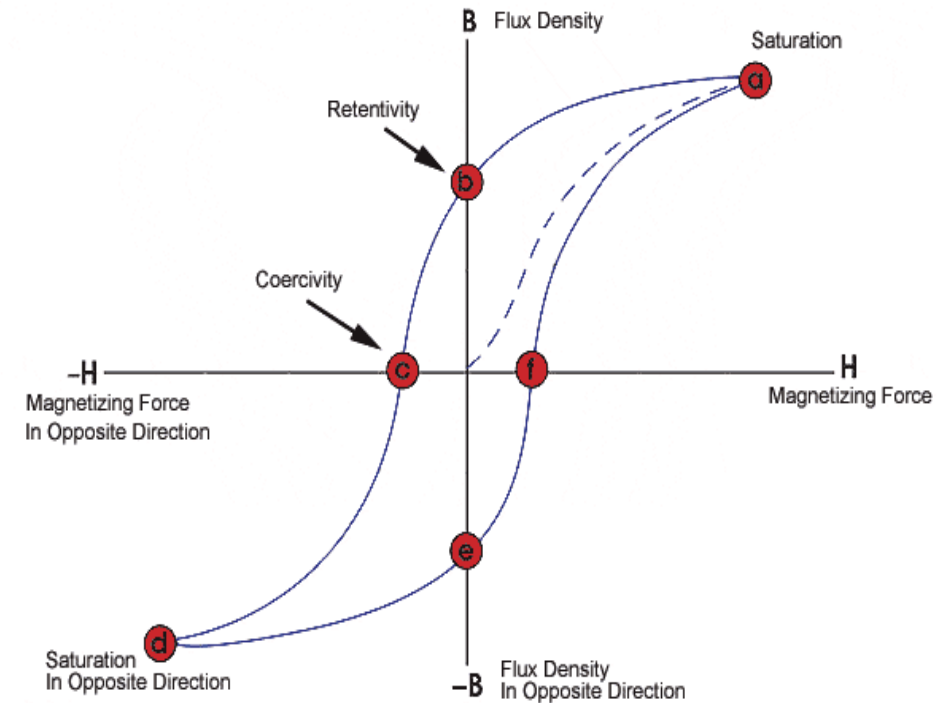
- ▶ Size variation according to the variation in percentage of Mg in ZnO.

Sample	Size (nm)
Pristine ZnO	22.82
1% Mg	17.06
3% Mg	44.66
5% Mg	42.62

SQUID studies

► Superconducting Quantum Interference Device

Sample	Remanance (emu/gm)	Coercivity (kOe)	Saturation (emu/gm)
Pristine ZnO	3.642×10^{-5}	0.09662	2.382×10^{-4}
3% Mg	2.284×10^{-5}	0.00814	1.05×10^{-3}
5% Mg	1.805×10^{-6}	0.01148	1.049×10^{-4}



Source: <https://www.nde-ed.org/EducationResources/CommunityCollege/MagP/article/Physics/HysteresisLoop.htm>

Scanning Electron Microscope data

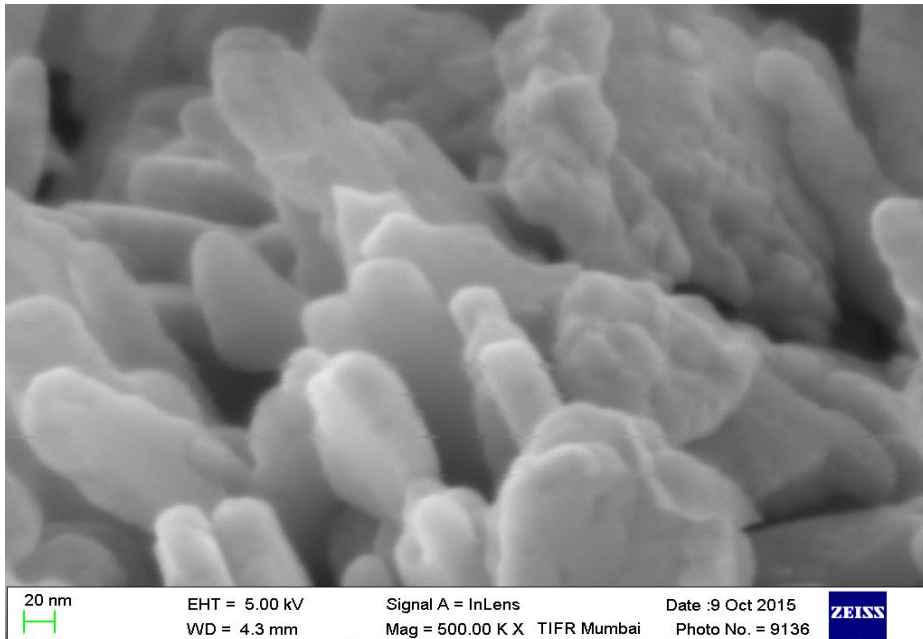
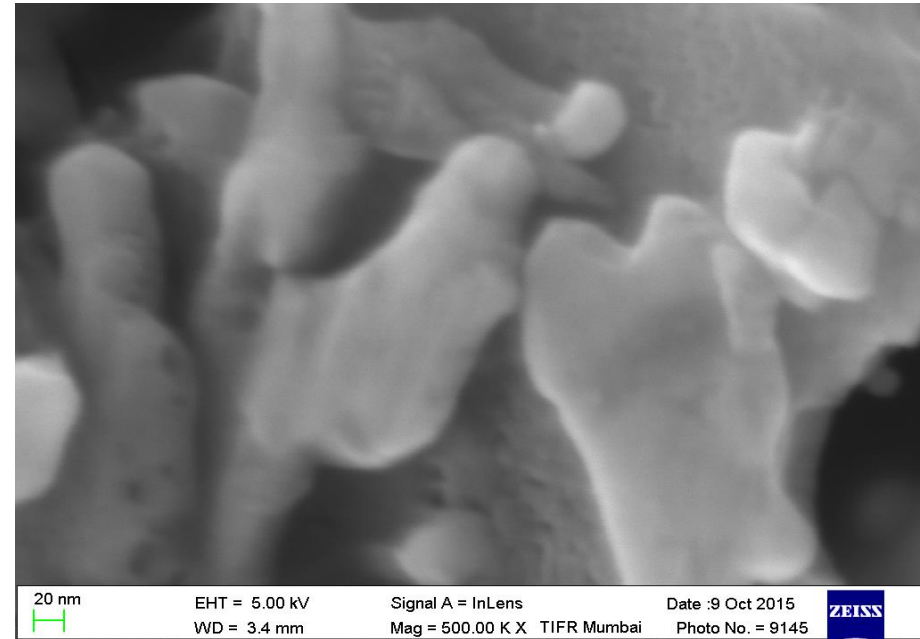


Figure: SEM scans of 3% Mg doped ZnO at 20nm

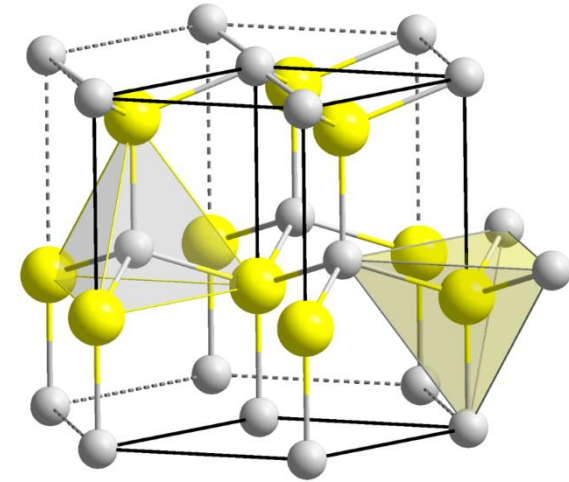
3% Mg doped in ZnO



5% Mg doped in ZnO

Interesting Results

- ▶ Almost every ritual performed by Indians has a well backed scientific purpose, the only glitch is that we aren't completely aware of its scientific reasons.
- ▶ The Mg doped ZnO DMS was found to have Wurtzite crystal structure.
- ▶ As the percentage of Mg is increased, agglomeration takes place which was seen in SEM characterization.
- ▶ grain size was found to be in the range 20nm-50nm from SEM results.
- ▶ possess ferromagnetic properties at room temperature.



Source:
https://en.wikipedia.org/wiki/Wurtzite_crystal_structure

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MUMBAI



RAMNARAI RUIA
COLLEGE, MUMBAI



UNIVERSITY OF MUMBAI

न चोर हार्यं न च राज हार्यं न भात्रू भाज्यं न च भारकारि
व्ययं कृते वर्धत एव नित्यं विद्याधनं सर्वधनप्रधानम

means

*Cannot be snatched away by thief, cannot be snatched away by king, Cannot be divided
among brothers, Not heavy either*

*If spent daily, it always keeps growing. The wealth of knowledge is the precious of wealth of
all*

THANK YOU FOR YOUR KIND PATIENCE...