A CONFERENCE REPORT - 2 (CHE(O)508)

SUBMITTED

TO

THE GUJARAT UNIVERSITY

IN PARTIAL FULLFILLMENT OF THE

REQUIRERMENT FOR THE DEGREE OF

MASTER OF SCIENCE

IN

CHEMISTRY

BY

ARPITA K. SISODIYA

Roll No :- 30 , EXAM NO :- 1400

SHRI P.H.G MUNICIPAL ARTS AND SCIENCE COLLEGE,

GUJARAT UNIVERSITY,

KALOL-382721

2022


GUJARAT COUNCIL ON SCIENCE AND TECHNOLOGY
GOVERNMENT OF GUJARAT
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This is to certify that Sisodiya Arpitaben Krupalsinh of Shri P.H.G Municipal Arts & Science College, Kalol has Participated in Oral Presentation at the GUJCOST sponsored National Virtual Seminar on "Nanotechnology : Chemistry and Biology at the Interface of 21st century" Organized by Ashok & Rita Patel Institute Of Integrated Study & Research In Biotechnology And Allied Sciences (ARIBAS) affiliated with the CVM University on 4th March 2022.
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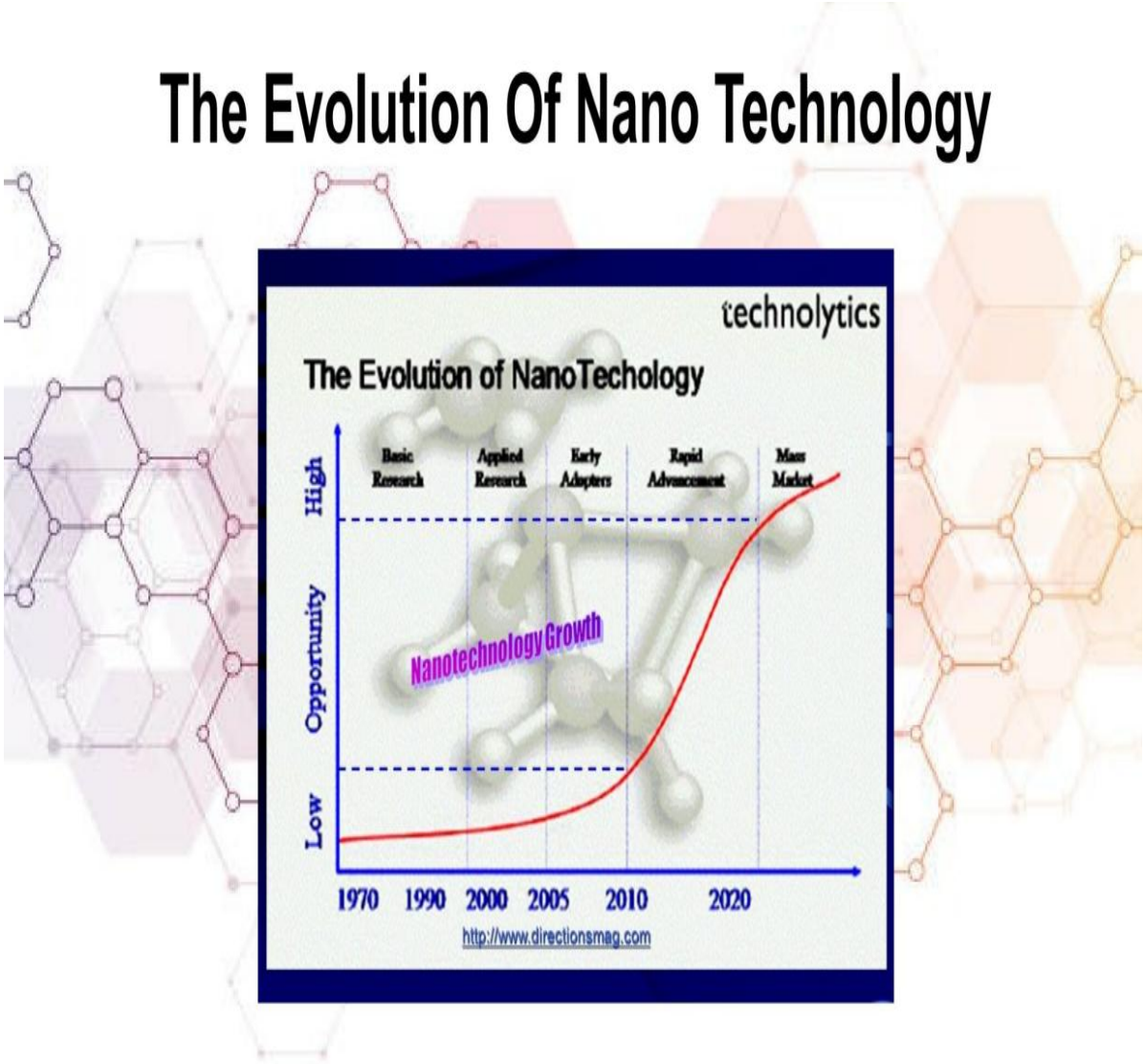
FIRST SLIDE OF ORAL PRESENTATION



DECLARATION

I, hereby, declare that the conference report (CHE(O)508) “ARIBS” submitted for the degree of Master of Science is not substantially the same as the one which has already been submitted for a degree or diploma to this or any other university or examining body in India or in other country. The attended from date 04/03/2022 online mode.

NAME: ARPITA SISODIYA
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EXAM NO : 1400

GUJCOST Sponsored One Day National Virtual Seminar Organized by ARIBAS New Vallabh Vidyanagar on 4th March 2022

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https://forms.gle/hd68pcMNZ68dLHwj6	**Dr. Ritu Dixit (942 754 7669)** **Dr. Khushal Patel (997 836 5630)**

INAGURAL SESSION
(10:30 am To 1:30 pm)

Speaker 1 (Key-Note Speaker)

Prof. K. Pandian Dept. of Inorganic Chemistry University of Madras, Guindy Campus, Chennai, Tamil Nadu	Rapid detection of Bacterial and Viral Infections	10:30 am To 11:30 am

Speaker- 2

Prof. Vandna Patravale Department of Pharmaceutical Science, Institute of Chemical Technology, Mumbai, Maharashtra	Nanotechnology in healthcare: Translational Case Studies	11:30 am To 12:30 pm

Speaker-3

Dr. Hemant Soni Associate Professor Department of Chemistry, M.S. University, Vadodara, Gujarat	Developing Iron Oxide Nanoparticles based Drug Delivery Platforms and *T1–T2* Dual Contrast Agents for Magnetic Resonance Imaging	12:30 pm To 1:30 pm

TECHNICAL SESSION -1

Speaker - 1 : PROF. K. PANDIAN

TOPIK :- RAPID DETECTION OF BACTERIAL AND VIREL INFECTION

❖ Nanotechnology approach for screening and killing of microbes

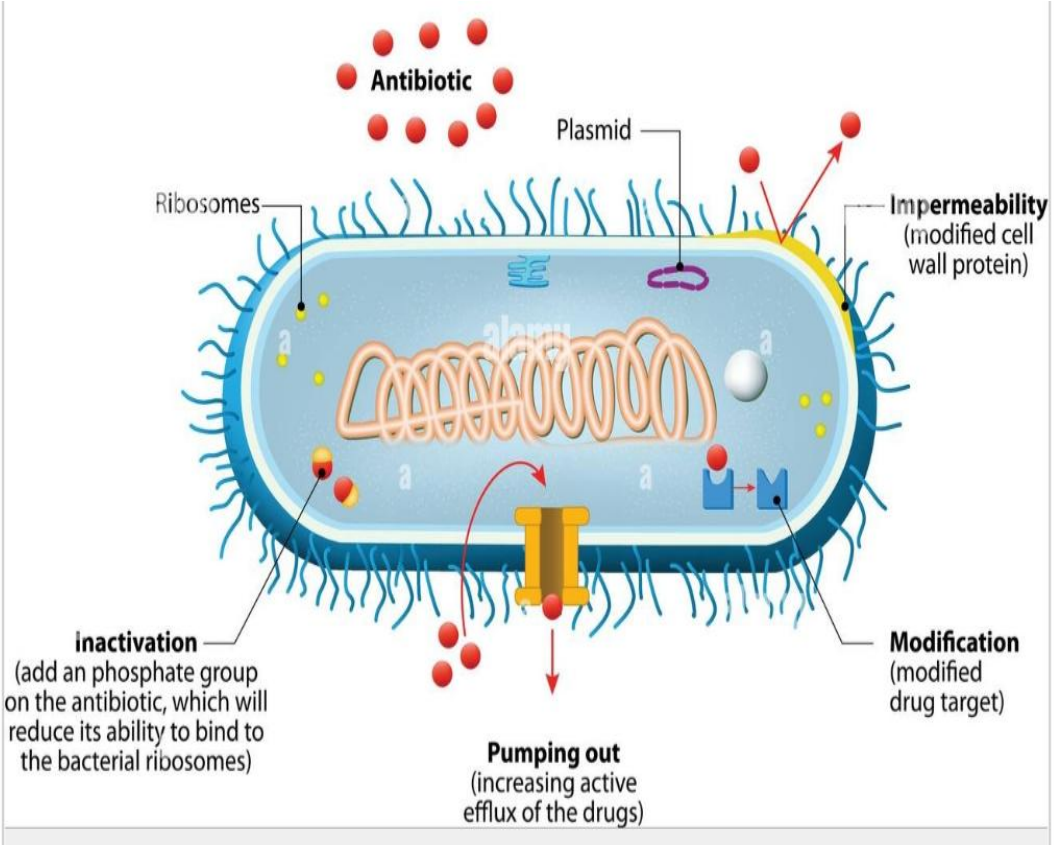
- ✓ Colloidal Gold nanoparticles - colorimetric detection of pathogenic bacterial sensing.
- ✓ Magnetic nanoparticles with coreshell nanomaterials for preconcentration and biofilm.
- ✓ Small peptide biconjugated nanomaterials for antibacterial application.
- ✓ Photothermal killing of bacteria.
- ✓ Drug conjugated gold and silver nanoparticles against drug resistant microorganism.
- ✓ Immunoassay approach using nanomaterials.

❖ Bacterial infection and detection

- ✓ Infections diseases are a major contributor to human mortality and pose a significant global threat to mankind.

- ✓ The bacterial led to fatal infectious diseases caused by contaminated food or water is a persistent and alarming situation to address.
- ✓ The early diagnosis of pathogens can create a considerable impact on shrinking the mortality rate.
- ✓ The conventional diagnostic techniques for bacteria detection in a clinical specimen include a time- consuming colony count assay.
- ✓ Polymerase chain reaction (PCR) and immunoassay such as ELISA.

❖ Mechanisms of antimicrobial resistance



Caused by the continuous intake of antibiotics

❖ A list of microbes causes various diseases

➢ Bacteria

- ✓ Ulcer
- ✓ Typhoid fever
- ✓ Gastroenteritis
- ✓ Cholera

➢ Fungus

- ✓ Aspergillosis
- ✓ Candidiasis
- ✓ Dermatitis
- ✓ Keratitis

➢ Virus

- ✓ Myocarditis
- ✓ Pharyngitis
- ✓ Hepatitis
- ✓ Meningitis

➢ Protozoa

- ✓ Nausea
- ✓ Encephalitis
- ✓ Fever
- ✓ Giardiasis

❖ Conventional method of pathogen detection

✧ Culture-based methods

- Physical appearance
- Chemical assays

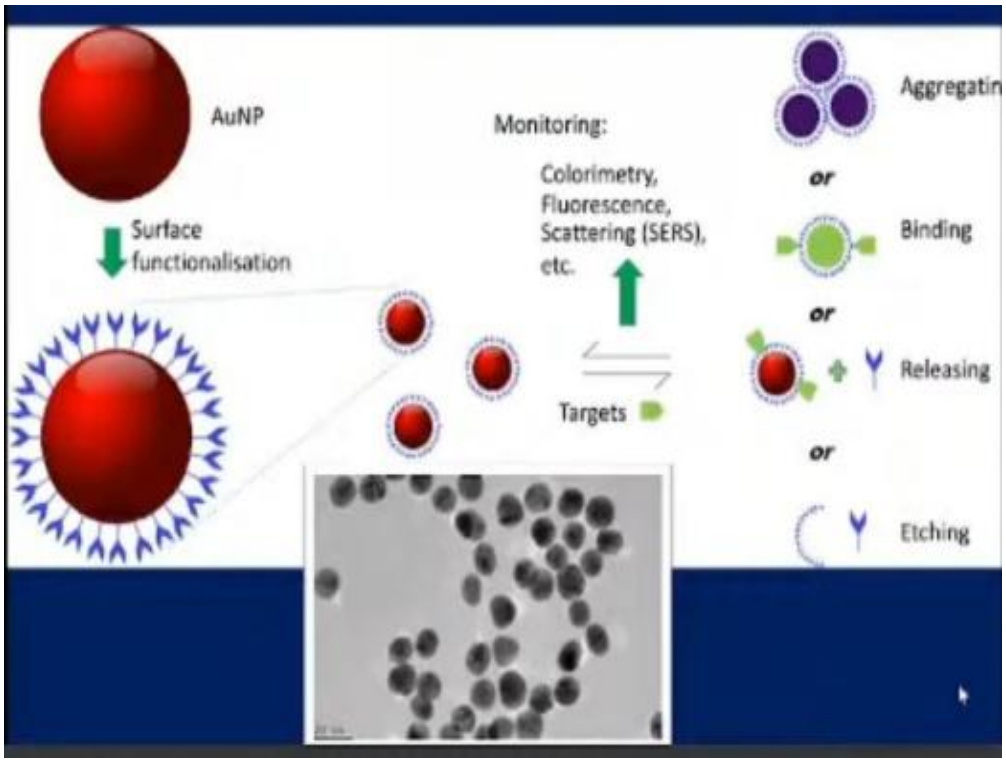
✧ Molecular method

- Polymerase chain reaction
- DNA microarrays
- Pyrosequencing
- Fluorescence in situ hybridization
- Peptide nucleotide acid assays

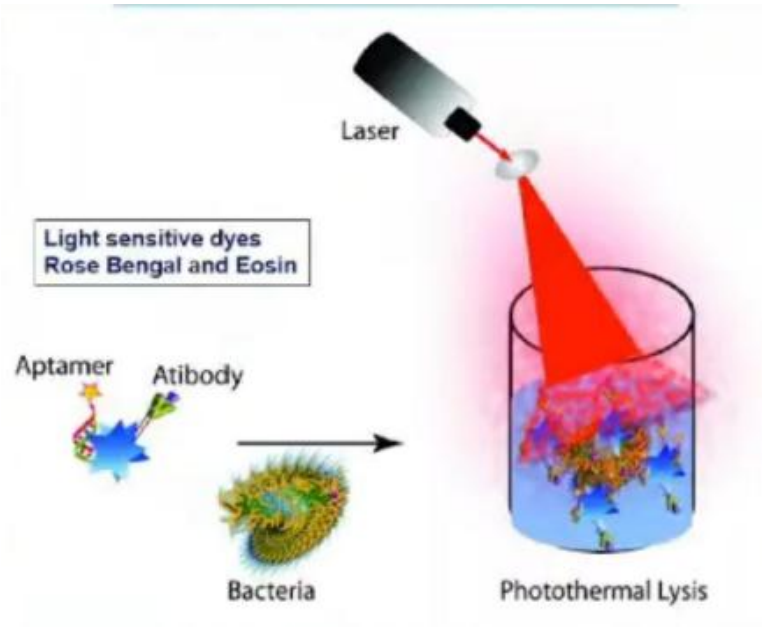
✧ Immunological methods

- Enzyme-linked immunosorbent
- Agglutination assay
- Immunofluorescence assay
- Plaque reduction neutralization assay
- Immunomagnetic separation assay

❖ Naked eyes detection and colorimetry assay



❖ Photothermal removal microbes



Bacteria	Nanomaterial	Method	Detection limit/ CFU mL^{-1}	Ref.
E. coli O157:H7	GNP	SERS	10	38
	QDs	Fluorescence	10^3	70
	Dye with magnetic NPs	Luminescence	20	71
	Dye with silica NPs	Fluorescence	16	72
Salmonella	GNP	SERS	10	17
	QDs	Fluorescence	10^3	73
	Dye with magnetic NPs	IR	10^4	74
	CNT	Potentiometric	10^4	75
S. aureus	GNP	SPR	10^4	57
	QDs	Fluorescence	10^3	76
	Magnetic	MALDI-MS	10^5	77
Listeria	TiO_2 nanowire	Impedance	10^2	78
	Magnetic	PCR	500	79
M. tuberculosis	Dye-doped silica NPs	Fluorescence	—	59

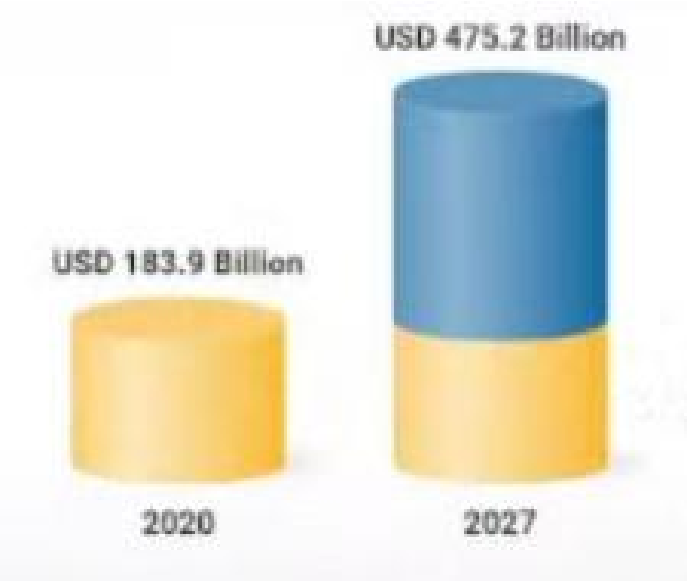
TECHNICAL SESSION -2

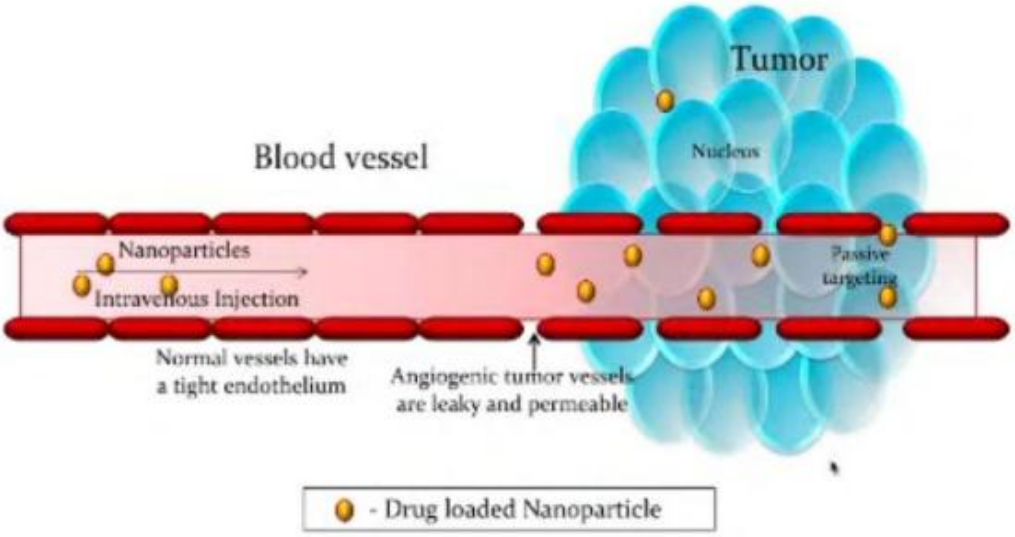
Speaker - 2 :- Prof. VANDANA PATRAVALE

Topic :- Nanotechnology in healthcare : Translation case studies

"In the past 75 years, the ability to manipulate matter At the nano (~1-100 nm) and micro (~100 nm - 100um) Scales with increasing precision has led to stunning Progress in an array of fields, including medicine."

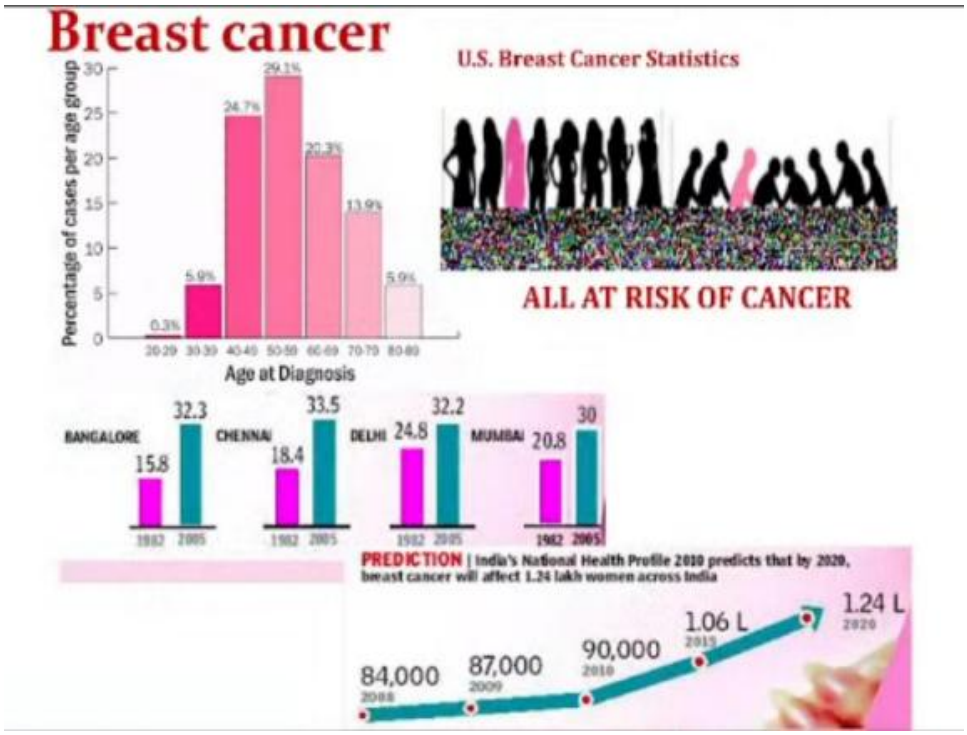
- **Global market for healthcare nanotechnology (Nanomedicine)**





Passive targeting of tumor tissue by intravenous route

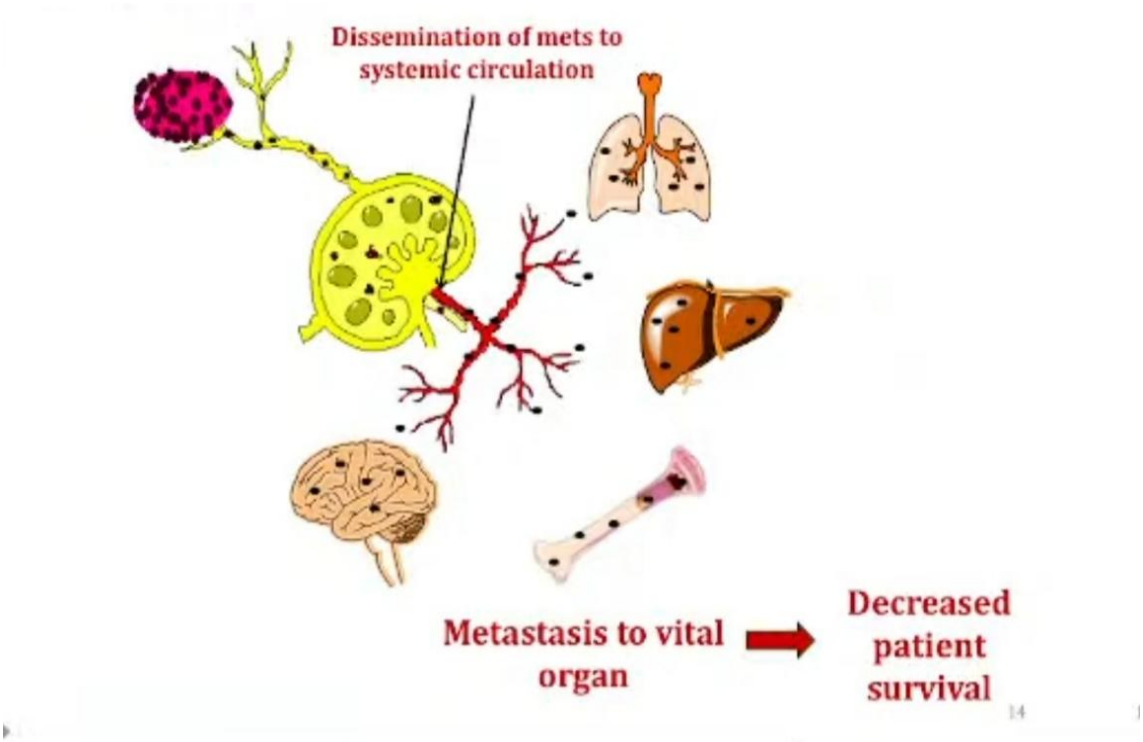
❖ Breast cancer



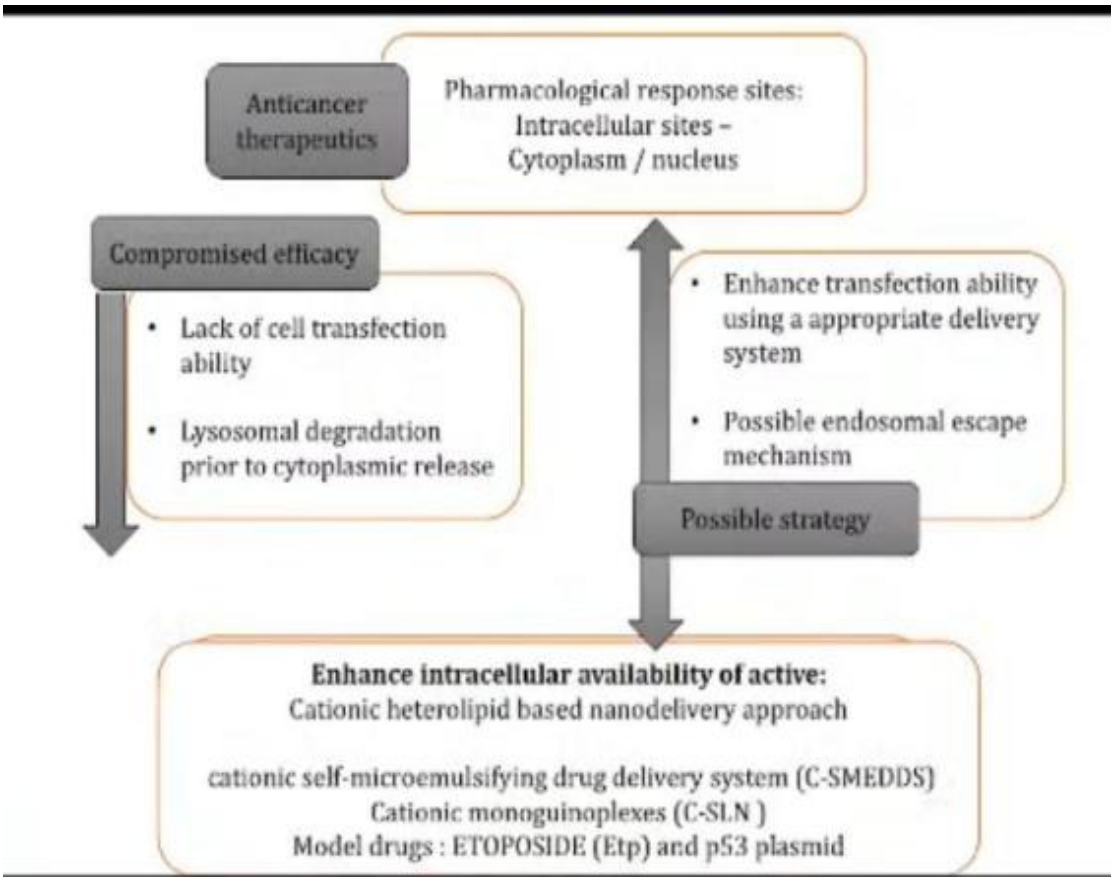
One among eight women are at risk of breast cancer over the course of life

Annually, more than one million women are diagnosed with breast cancer and over than five lakhs die from the disease.

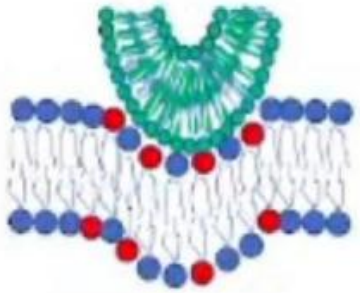
➢ Metabolism



❖ Anticancer therapeutics

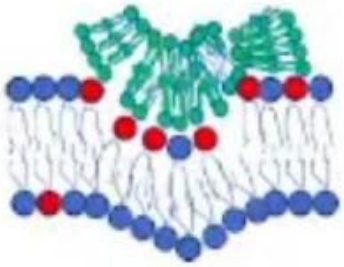


❖ Cationic heterolipid : Flip flop phenomenon



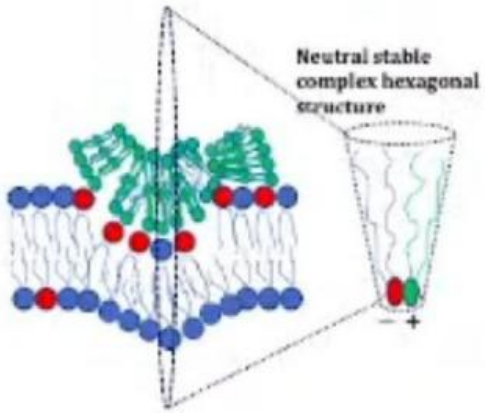
Flip flop phenomenon:

Reorientation of anionic endosomal membrane lipid to luminal face



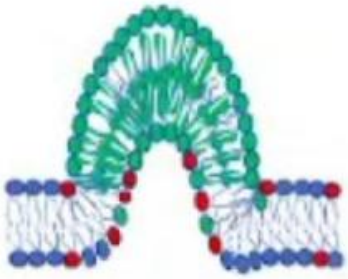
Stable cone complex

Quaternary ammonium group of cationic lipids with negatively charged phosphate group of anionic lipid.



Stable cone complex

Reversible to inverted hexagonal structure at an acidic pH



Reverted structure induced destabilization of the endosome

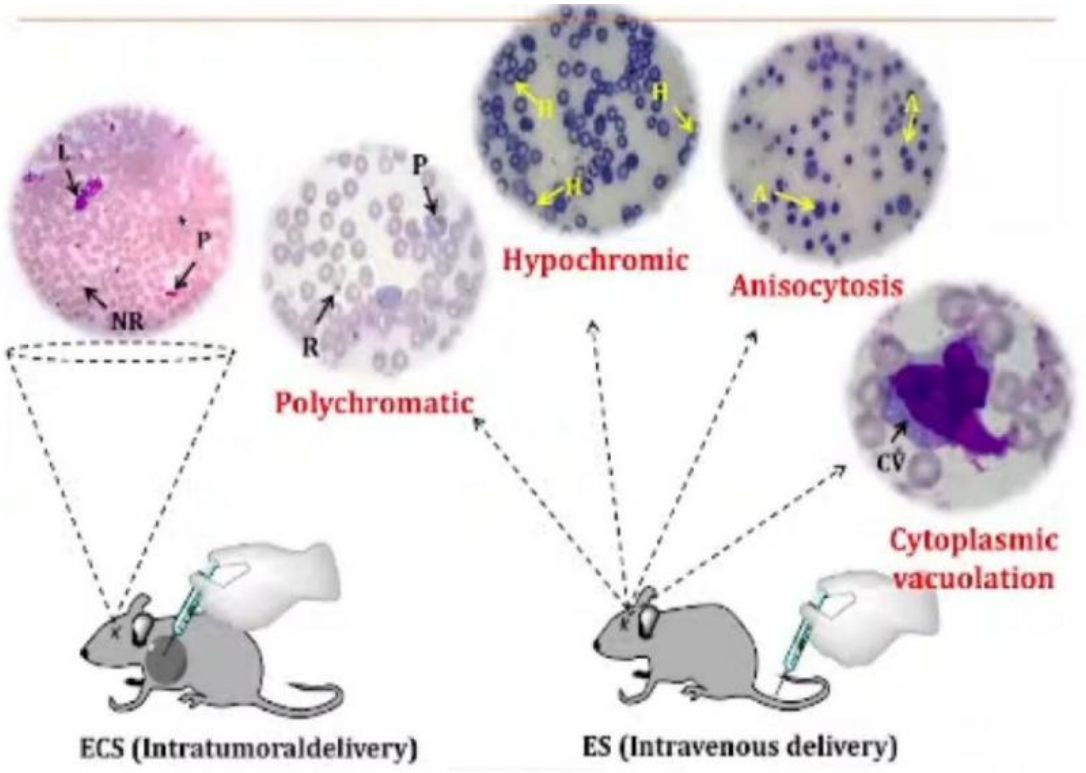
↓

Endosomal escape

↓

Intracellular delivery of drug

❖ Morphological alteration in systemic cells



➢ Problem associated with gene therapy

- DNA (polyanionic & large hydrodynamic volume)
- Nucleases - extensive degradation
- Lysosomal degradation in endosome

TECHNICAL SESSION :- 3

Speaker :- Dr. HEMANT SONI

Topic :- Developing iron oxide nanoparticles based drug delivery platforms and T1-T2 dual contrast agents for magnetic resonance imaging

- Now days, nanoscience and nanotechnology are boon to The patients suffering from diseases like cancer, diabetes ,Alzimers etc.

- Especially in the case of cancer. It requires early and explicit diagnosis followed by target specific treatment.

- The traditional treatment like chemotherapy is vigorous and non-specific.

Ideally, factors like

- ✓ Psychology of the patients
- ✓ Efficacy of the drugs for the disease
- ✓ Immune response
- ✓ Competence of the patient toward drug dosages etc.

Should be considered before adopting any treatment for cancer.

Established drug like

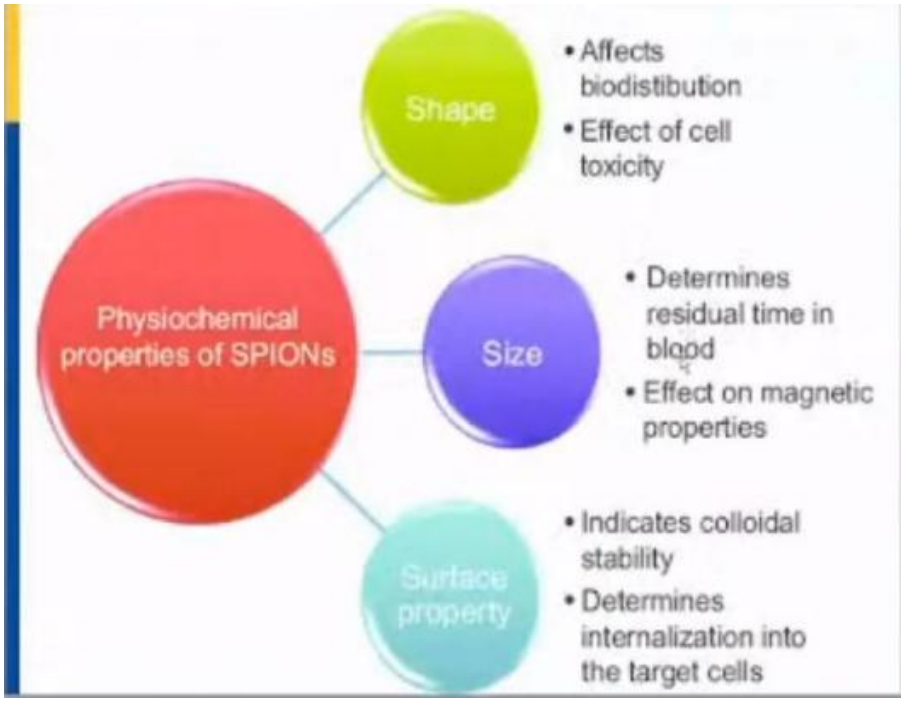
- ✧ Cis-platin
- ✧ Taxol
- ✧ Paclitaxol
- ✧ Doxorubicin

Available in the market even though highly effective, cause many side-effects in patient due to non-specificity and insolubility in body fluid.

Surface engineered super paramagnetic iron oxide nanoparticles (SPIONs) are the best option available for the purpose. The advantages of SPIONs as drug carrier over the traditional delivery vehicles are

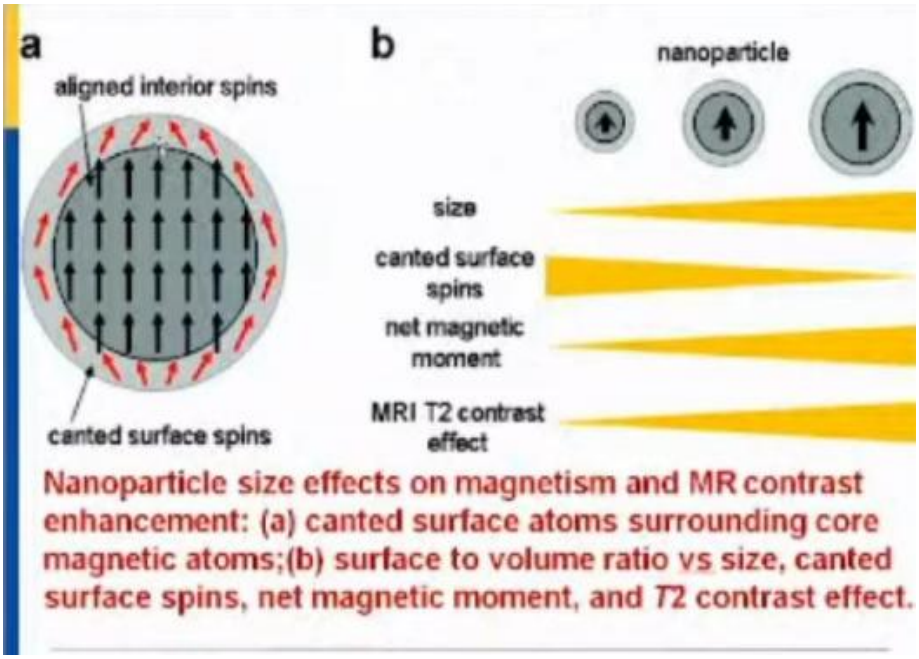
- ✧ The partical size
- ✧ Shape and
- ✧ Surface charges

Can be turned according to the requirement.



In an ideal case, contrasting efficiency can be compared with twinkling of the stars in the background of the night sky .

Same ways, contrasting agent should enhance (or nullify) the signals coming from lesions compared to other regions.



Nanoparticle size effects on magnetism and MR contrast enhancement: (a) canted surface atoms surrounding core magnetic atoms;(b) surface to volume ratio vs size, canted surface spins, net magnetic moment, and *T2* contrast effect.

Such type of water molecules known as inner sphere water molecules are mainly responsible for contrasting effect due to different longitudinal relaxation rate than normal bulk water molecules present in the vicinity.

- **T1 is a time required for longitudinal magnetization to recover to 63% of the equilibrium value**

Shorter T1 ➡ **Faster recovery** ➡ Enhancement in signal intensity

The efficiency with which the contrasting agent enhances the water proton relaxation rate is referred as relaxivity r.

Traditional MR imaging using T1 or T2 contrast agents has certain limitation related to refinement of signals originating from artifacts such as fat. Calcification, hemorrhages, air etc) other than diseased lesions.

These make the image complicated and difficult to map the area of disease spread, in most cases.

Leaching of dopant metal ion (particularly Gd) from the host matrix was a major safety issue to be solved.

It was observed that these leached Gd ions, upon organ uptake, cause toxic side effects such as nephrogenic systemic fibrosis(NSF)

Therefore it is desirable to develop a contrast agent, either single or dual mode free from Gd ions.

One of the solution of this problem is to design T1-T2 dual mode contrast agent i.e. insertion of T1 contrast agent to the matrix of T2 agent.

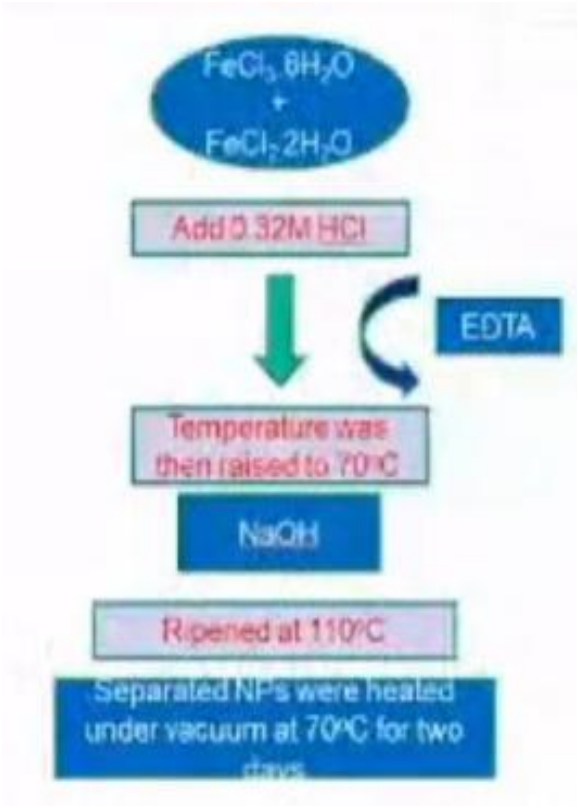
Considering these points we can design the structure of the contrasting agent such that both T1 and T2 modalities can be induced in a single material.

- **r2 relaxivity can be achieved by controlling the particle size of the SPIONs and**

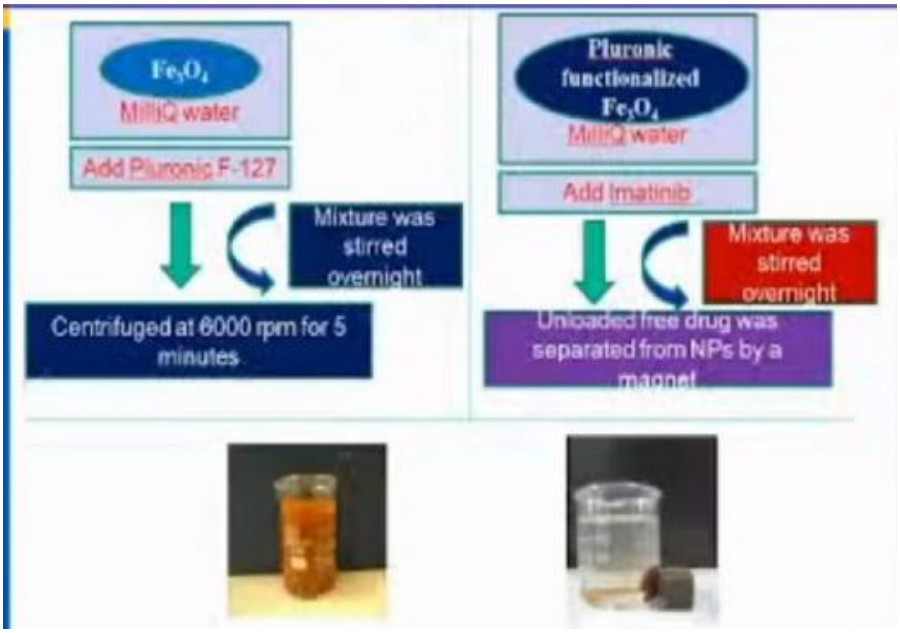
- **r1 by mimicking the working mechanism of Gd complexes.**

Schematic illustration for the synthesis of gadolinium- labeled magnetite nanoparticles (GMNPs) as dual contrast agents for T1- and T2- weighted magnetic resonance imaging.

❖ Preparation of Fe3O4 Nanoparticles



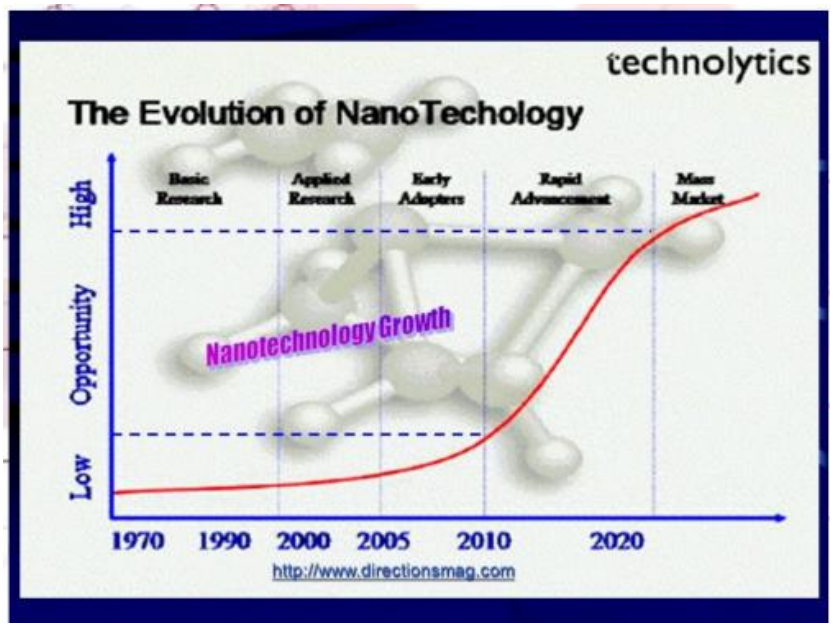
❖ Formulation of imatinib mesylate loaded Fe3O4 Nanoparticles



ORAL PRESENTATION

Topic : Nanotechnology

❖ The Evolution of Nano Technology



❖ Nanotechnology not new to india says nobel laureate

Delivering talk on "the contribution of elemental carbon to the development of nano science and technology "at the indian institute of chemical technology, hyderabad, nobel laureate robert f curl said thet carbon nanotechnology was much older than carbon nano science.

He said that up to the middle of 18th century the steel swords depended on this particular material and when the mines in india stopped "they lost the technology".

He also said that glass was covered with nano patricles of gold and silver. He said people were using such materials without understanding what they were doing for a long tie.

❖ Nanosize

The word nano is taken from the greek word “nanos” meaning dwarf. It is prefix used to describe “one billionth” of something.

❖ 0.000000001 metre

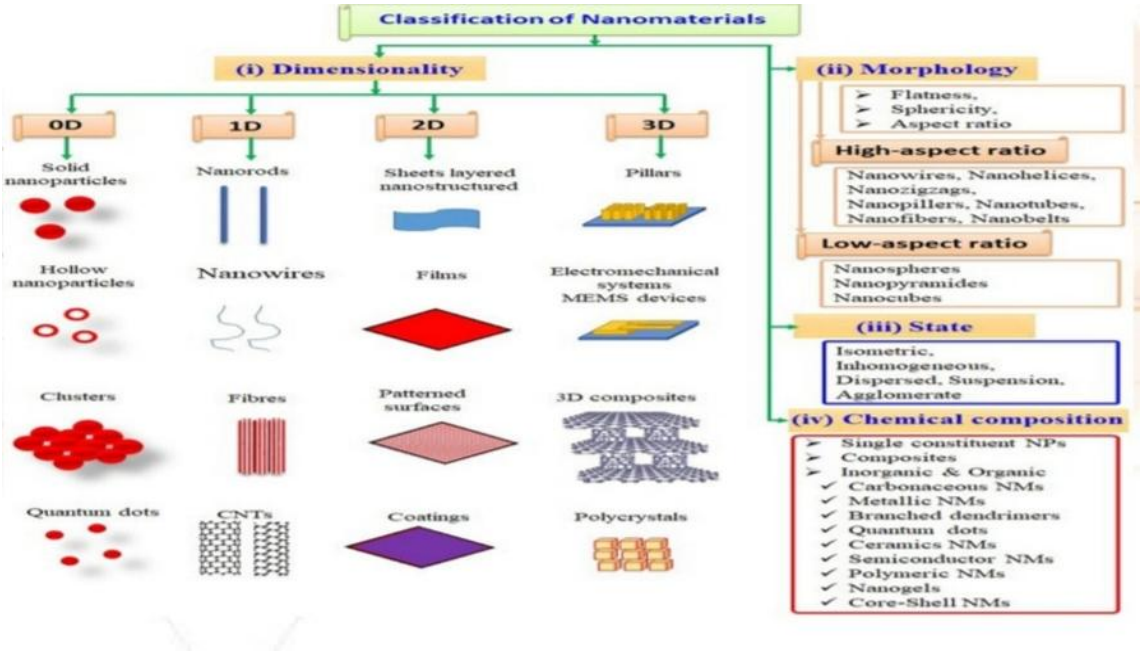
- One billionth of meter is one nanometer
- One nanometer is approximately 6 carbon atoms wide
- A hydrogen atom is 0.1 nm
- Human height : 1.7 billion nm

❖ Nanoscience and technology

Particles less than 100 nm in diameter are said to be nanomaterials and the study of science sof such materials is called nano science.

Nanotechnology is the design, characterisation production and application of structure, devices and systems by controlling shape and size at nanometre scale.

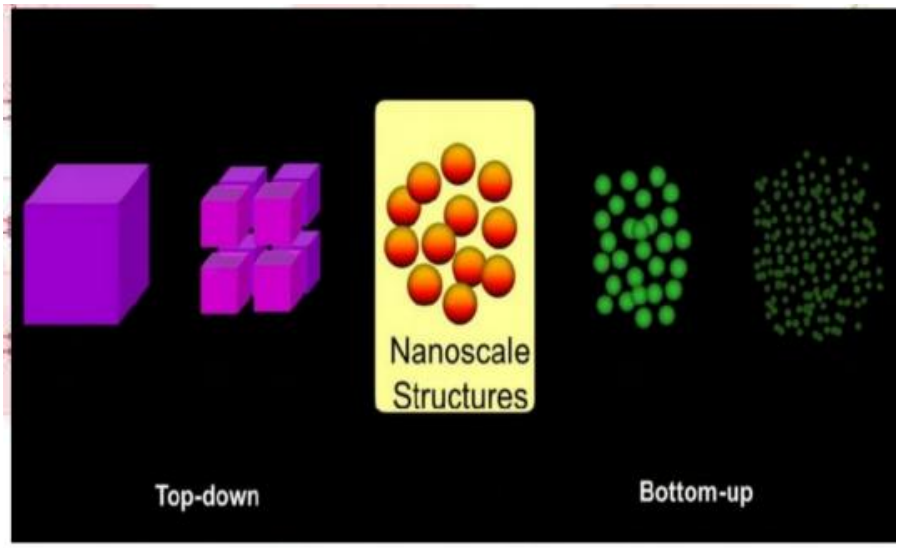
❖ Nano material



❖ Top down bottom up approach

The top down approach of miniaturization of the components as advanced by richard feynman in his often cited 1959 lecture starting That " there is plenty of room at the bottom".

The bottom up approach of the self assemble of molecular components ,where each molecular of nanostructured component plugs itself into a suprastructure. This approach was pioneered by jean marie lehn, revealing that "there is a plent of room at the top"



RICHARD P FEYNMAN
US PHYSICIST
NOBLE PRIZE IN 1965

JEANS MARIE LEHN
FRENCH CHEMIST
NOBEL PRIZE IN 1987

❖ Why do we want to make small things?

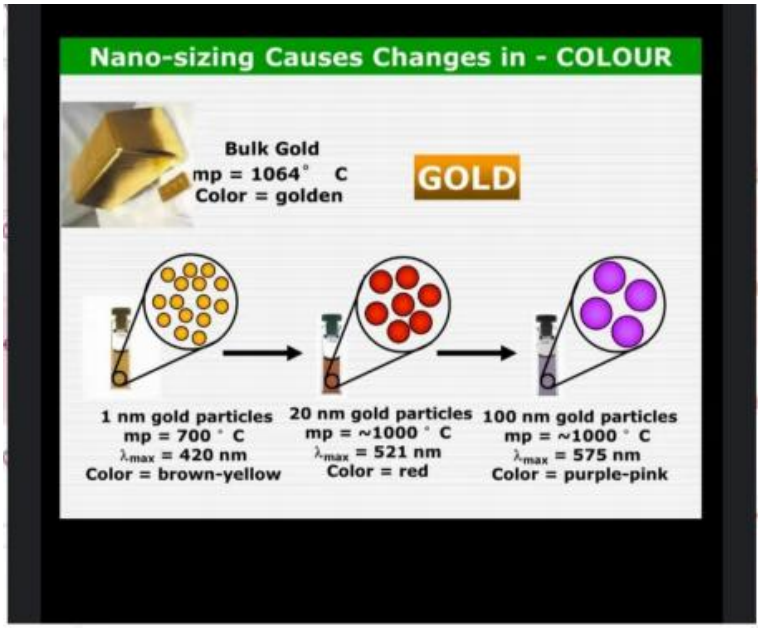
To make products smaller , cheaper, faster and better by "scaling" them down. (electronics, catalysts, water purification, solar cells, coatings, life science , etc)

To introduce new physical phenomena for science and technology. (quantum behaviour and other effects)

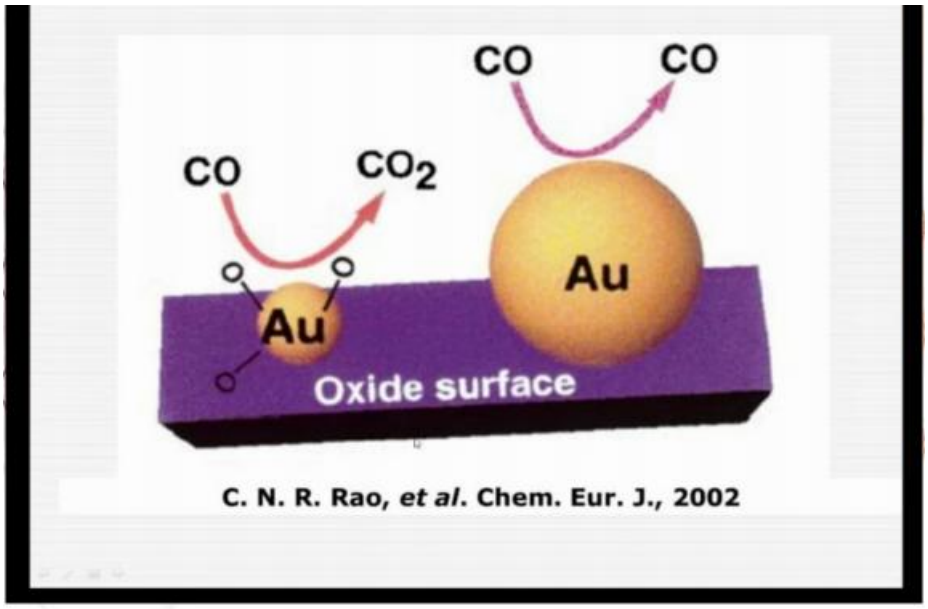
❖ Nano - marerials

- ✓ Nano materials are not simply another step in miniaturization but a difference arena entirely; the nanoword lies midway between the scale of atomic and quantum phenomena, and the scale of bulk materials.
- ✓ N this nanoscale regime neither quantum chemistry nor classical laws of physics hold.
- ✓ N materials (metals, semiconductors or insulators) where strong chemical bonding is present, delocalization of valence electrons can be extensive, and the extent of delocalization can vary with size.
- ✓ This effect coupled with structural changes can lead to different chemical and physical properties depending on size.

❖ Nano-sizing



❖ Nano - sizing changing in chemistry

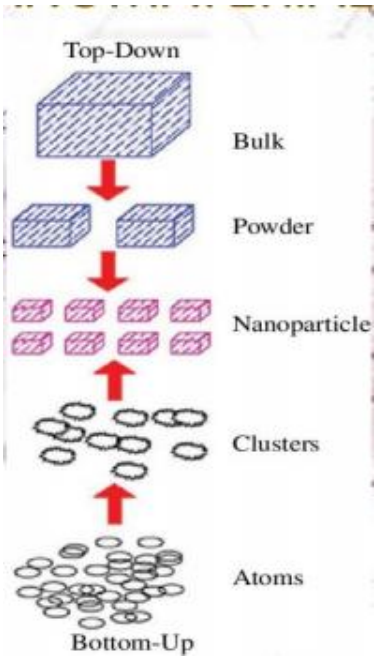


Synthesis of nanomaterials

There are two approaches for synthesis of nano-materials and the fabrication of nano structures.

1. Top down approach refres to slicing or successive cutting of a bulk material to get nano sized particle.

2. Bottom up refres to the build up of a material from the bottom; atom by atom, molecule by molecule or cluster by cluster.



❖ Method of characterization of nanoparticles

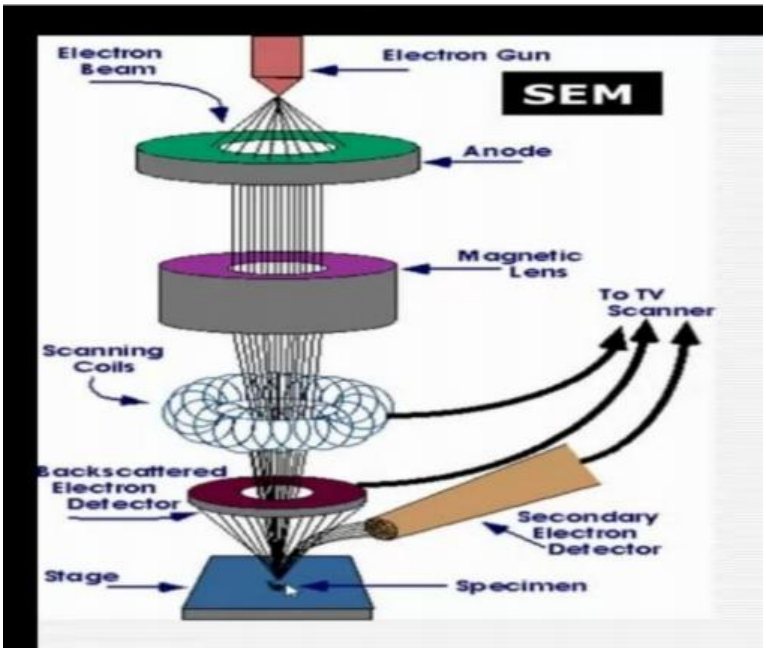
SEM

TEM

AFM

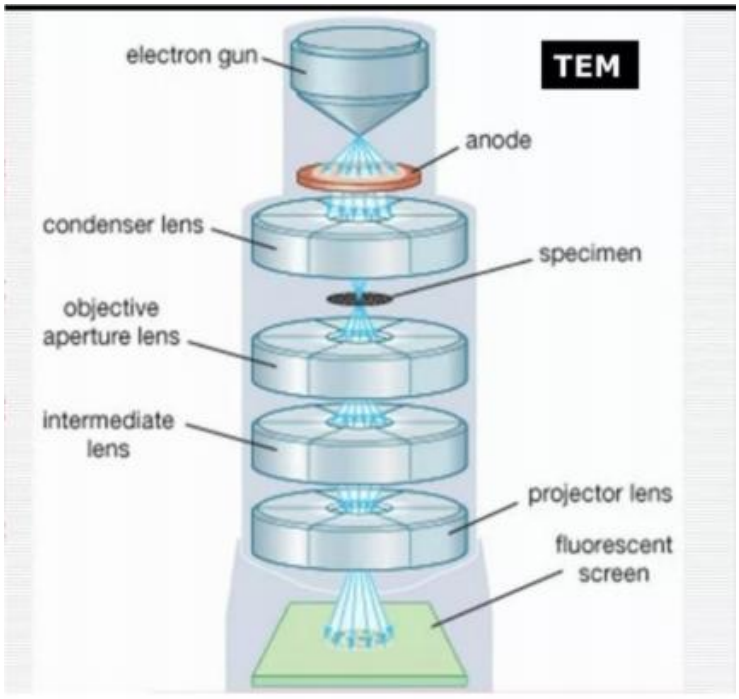
➢ SEM

SEM is an electron microscope that images the sample surface by scanning it with a high energy beam of electrons.



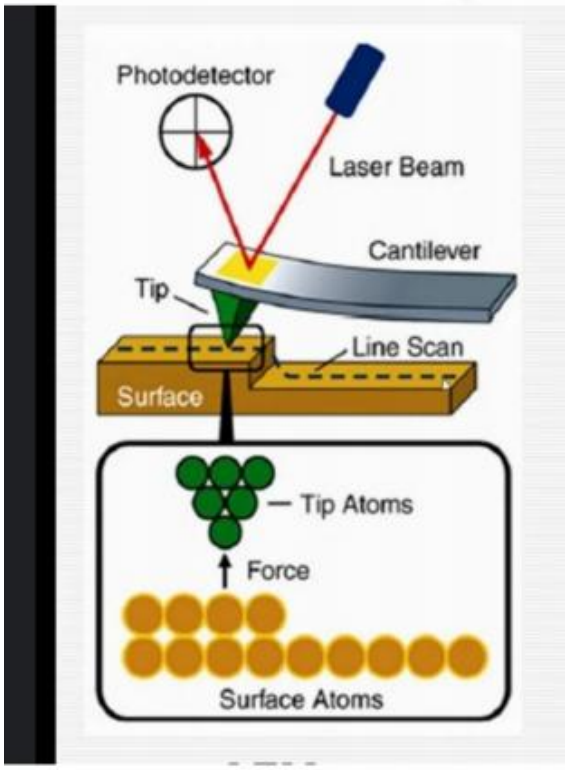
❖ TEM

TEM is a microscopic technique where by beam of electrons transmitted through an ultra thin specimen interacts as it passes through the sample. An electron beam illiminates the sample, and transmitted beam is imaged.



❖ AFM

Atomic force microscope allows for 3D characterization of nano - particles with sub - nanometer resolution.



Valedictory Session

After quiz test in valedictory session all speakers and chairperson vote of thanks and all participants thanks attended the all session webinar for international symposium on chemical wisdom by her.

Certificates were distributed to the students who appeared first, second, third in the poster presentation & oral presentation.

Certificate were then distributed to other students as well.

At the end of the day, the completion of this program was announced.

Conclusion

I really enjoyed the program these concept and the material presented will most definitely be incorporated into my resources. I Like it presenter was very knowledgeable and offered valuable information and tips. I learned several key pieces of information that will greatly improve my ability to publish.