Ayurvedic Bhasma as Nanomedicine and Modern Scientific Techniques

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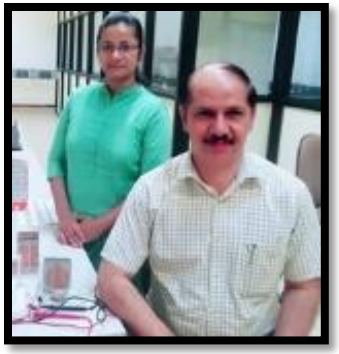

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Bhasma as Nanomaterials – General introduction

An Ayurveda *Bhasma is* an inorganic medicine i.e **the ancient Indian wisdom**, which is used since ancient time for treatment of different human diseases such as: sexual debility, Cancer, Leukemia, Diabetic etc.

However, the knowledge of chemical and ingredients contained in bhasma is limited which is restricting its use as nanomedicine in the modern era by Global communities.

Also the year 2015 Nobel prize in medicine has motivated many researchers towards traditional medicines.

Hence, the different chemical and physical properties of *bhasma* has been studied by modern experimental techniques e.g. XRD, VSM, SEM, FTIR and PL spectrometer etc. and various Biomedical investigations shows, Bhasma as nanomedicine.

Nanoscale Properties and Nature

Nanotechnology

A nanometer (nm) is one billionth (10^{-9}) of a meter

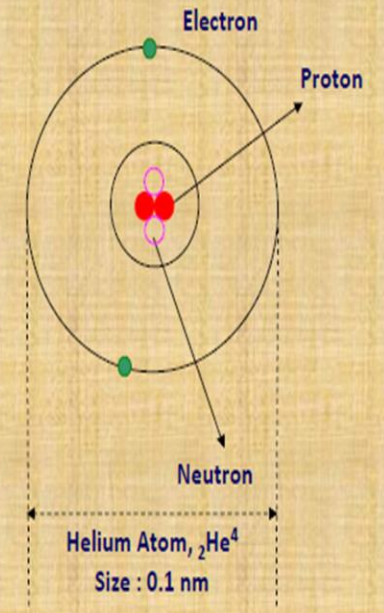
Thickness of a human hair ~ 80,000 nm

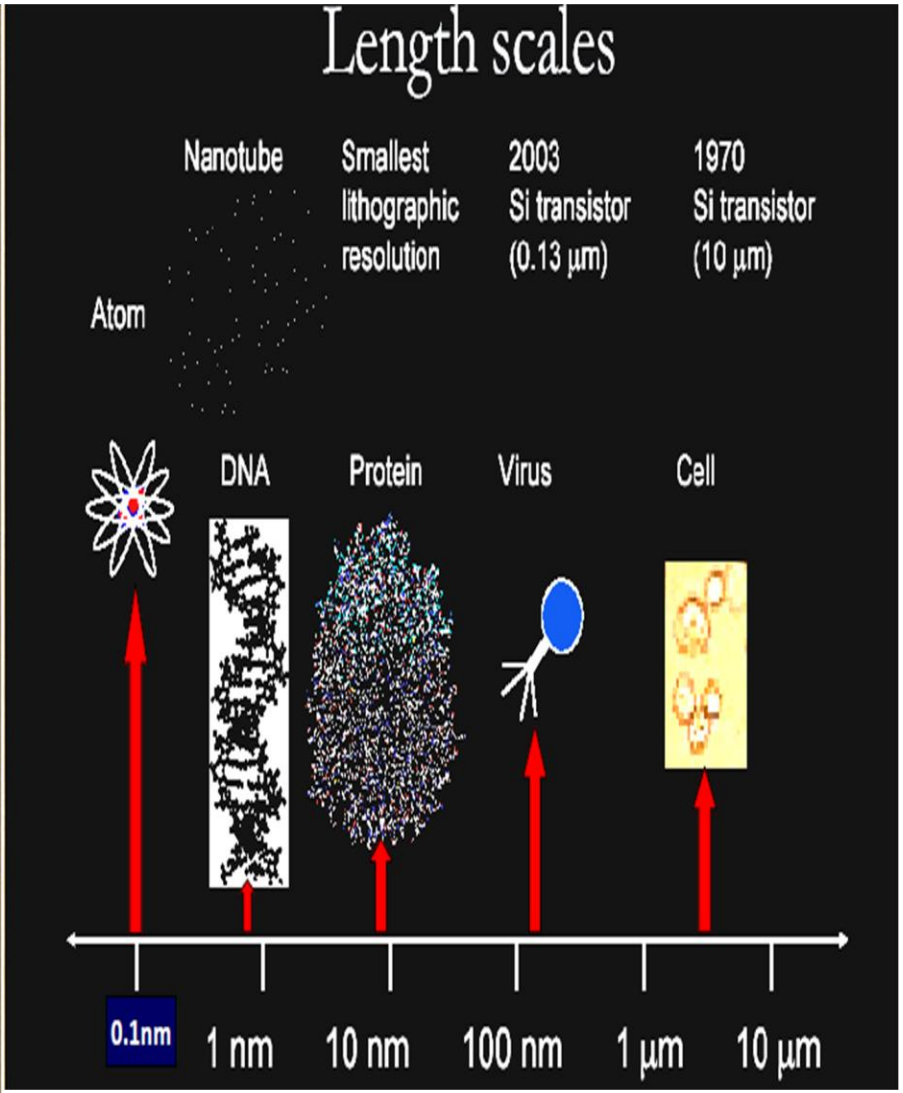
Nanometer: 10^{-9} m = 10 x 10^{-10} m = 10 atoms in a line

(one atom, $_2He^4$ ~ 10^{-10} m ~ 0.1 nm)

Sub-Nanometer Sizes:

- Electron ~1.986 x 10^{-18} m
  ~ 2 x 10^{-9} nm
- Proton ~10^{-15} m ~ 10^{-6} nm
- Neutron ~ 10^{-6} nm
  ~ 1/1,000,000 nm)





NATURE, CURIOSITY, NANOMATERIALS PROPERTIES AND FUTURE PLAN

Lotus Leaf always clean

Seashell hard And Chalk-soft

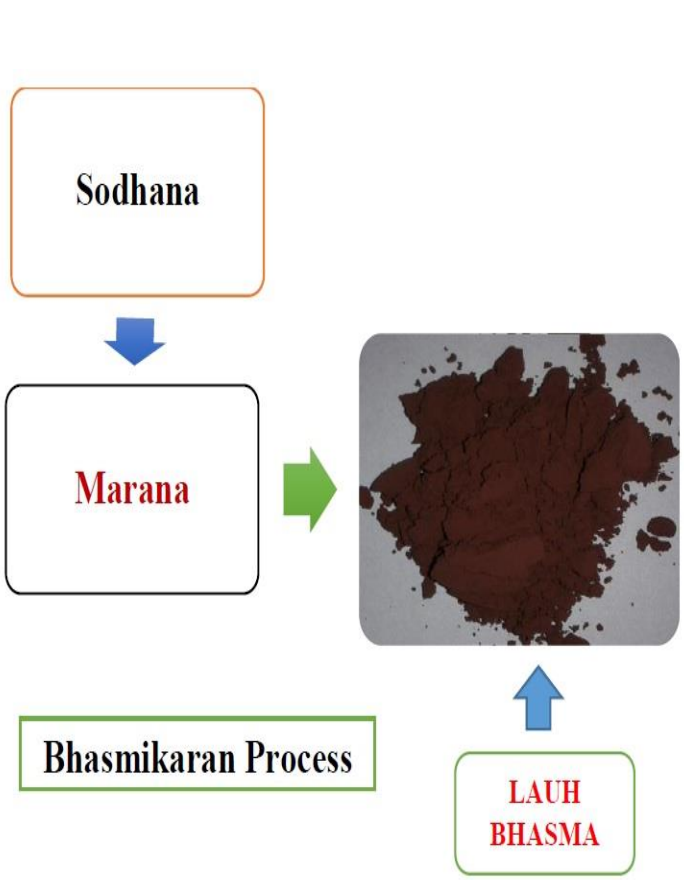
Sharpness of Damascus Dagger

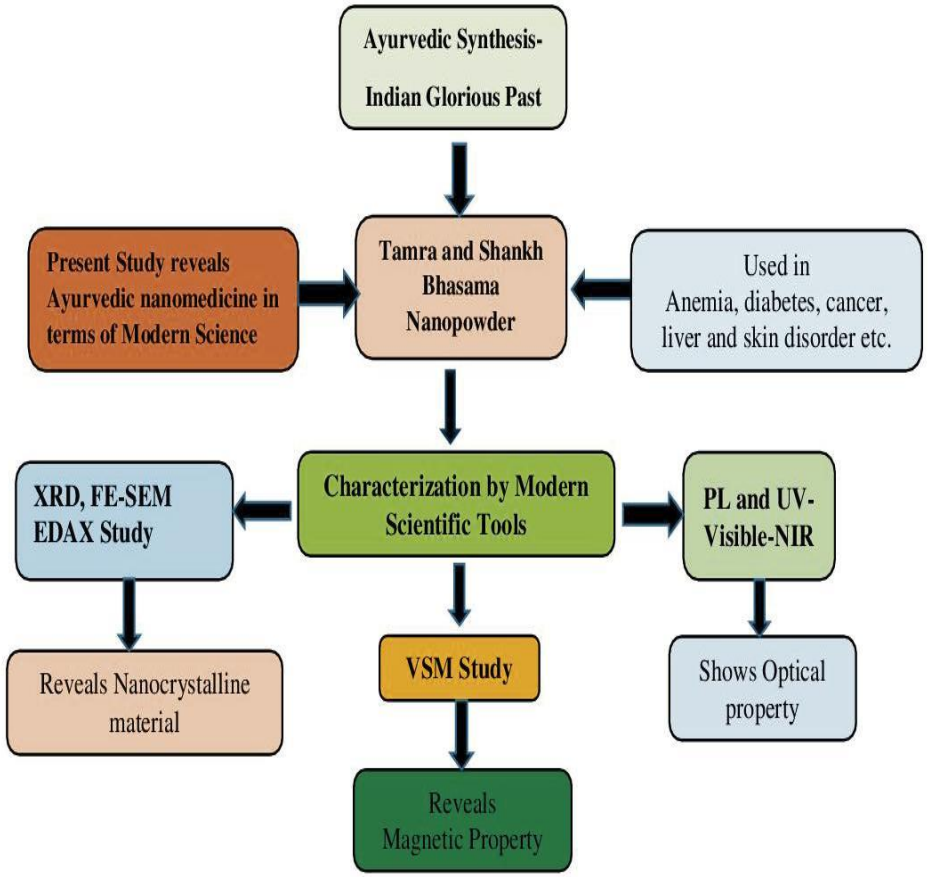
Luminescence of Lycurgus Cup

Migration of Bird

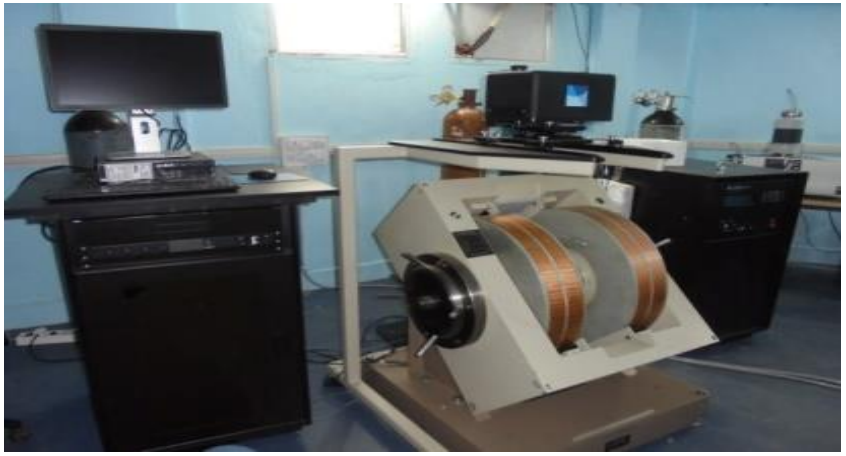
Multi colour Butterfly

Synthesis and Modern Scientific Tools





Some Modern characterization Tools



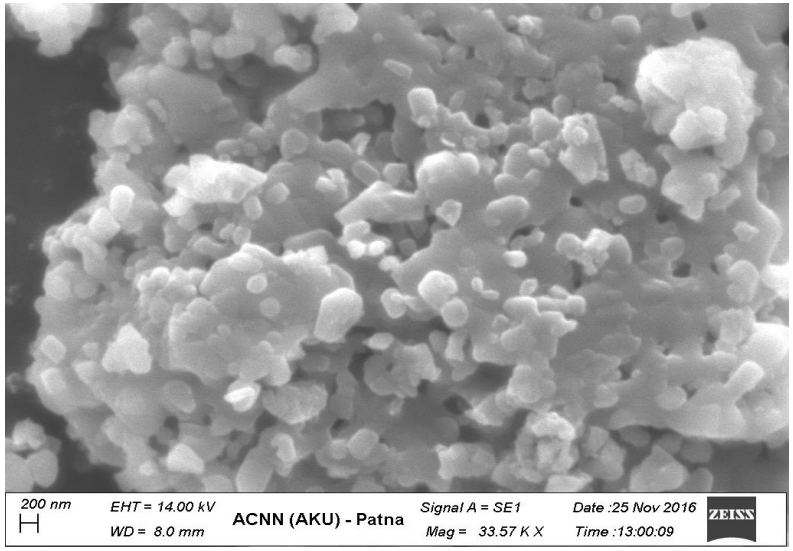
Vibrating Sample Magnetometer

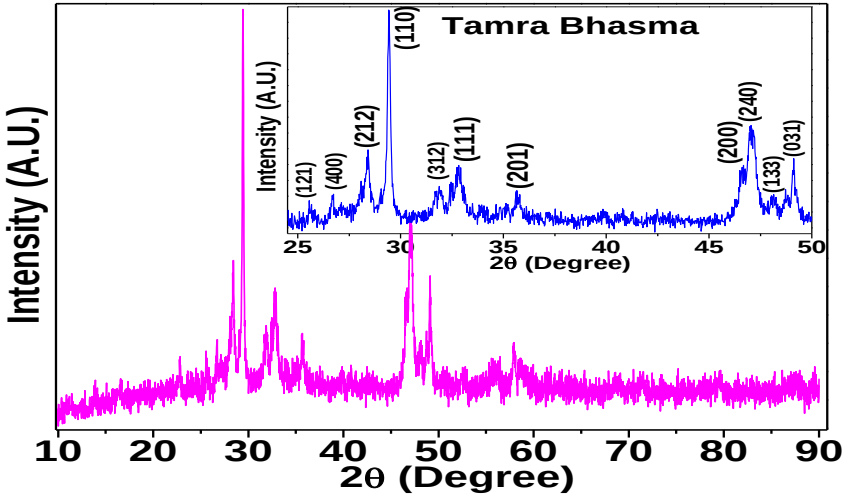
Scanning Electron Microscope

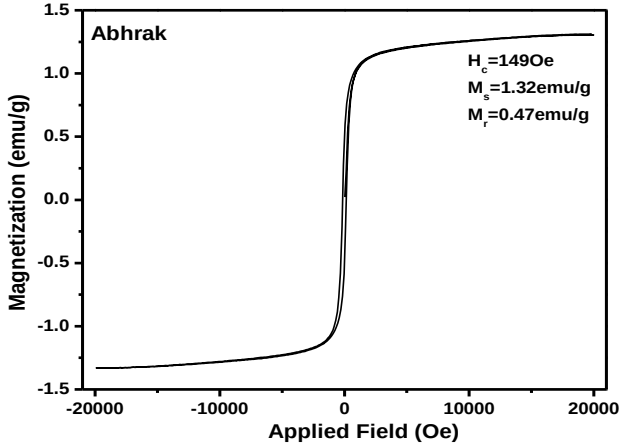
X-ray Diffractometer, Fourier Transform Infrared spectroscopy and Photoluminiscence spectrometer

Ayurvedic Bhasma as Nanomaterial's and Modern Scientific Tools

Rakesh Kr Singh, Sanjay Kr, Abhay Kr Aman, Manoranjan Kar, Internation J. Ayurvedic and Integrative medicine (2017)1-7, Elesevier







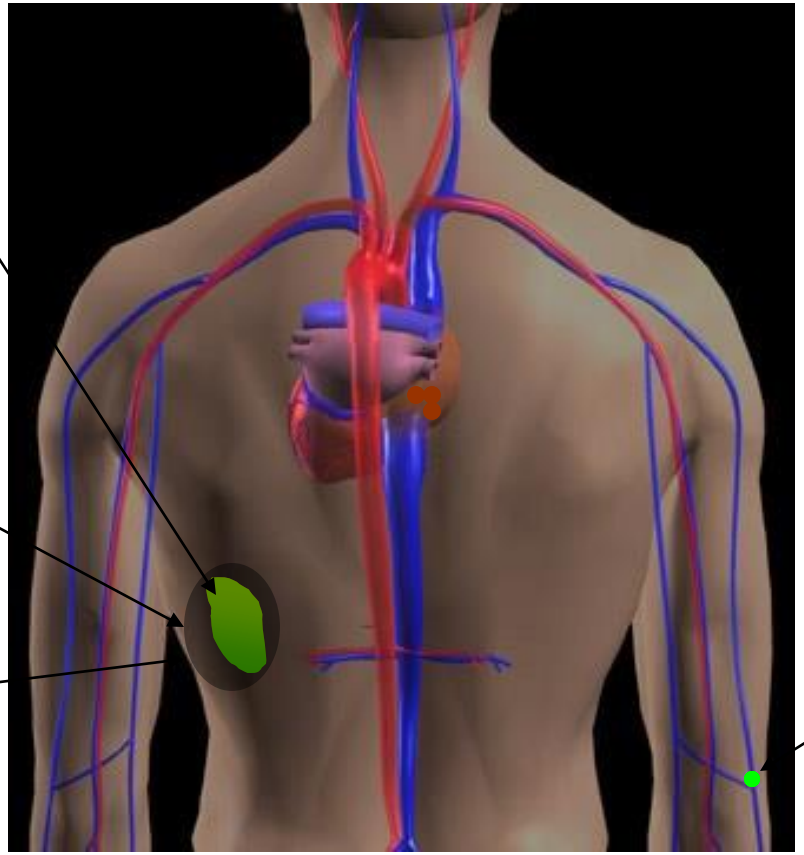
Structural, Microstructural and Magnetic measurement of Tamra bhasma reveal that bhasma are nanocrystalline super paramagnetic, uniform size distributed particles that support its medicinal value together with better action on disease treatment. This reminds our ancient Indian wisdom was so great. Hence we should not forget our root/ancestors.

Nanoparticles in Guided Drug Delivery

Solid tumor

Apply magnetic field to concentrate particles

Modulate field to release drug from particles

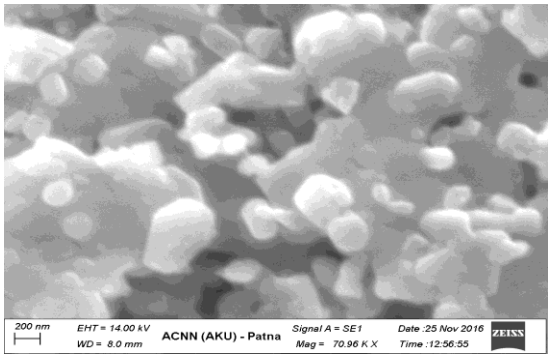


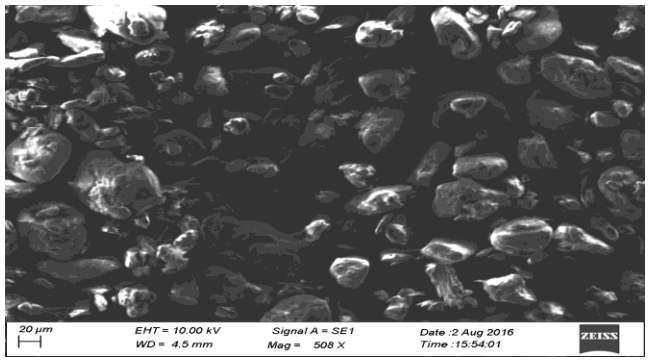
Other options for targeting:
1 - Direct injection into tumor site
2 - Coating NMP with antibodies to target tumor

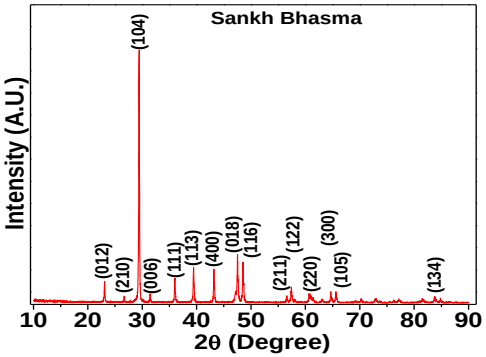
Inject NMPs IV, NMP will circulate through the blood stream

In Search of Microstructural Identity

'microstructure' would mean size, morphology, phase, surface area







Aspects of Powder technology in ancient & medieval India

Powder Metallurgy 33 (1990) 119-125

Silver powder was prepared by the method of Vagabhatta

Distinct morphology

Mechanically joined interface

Particle size 15-40 um

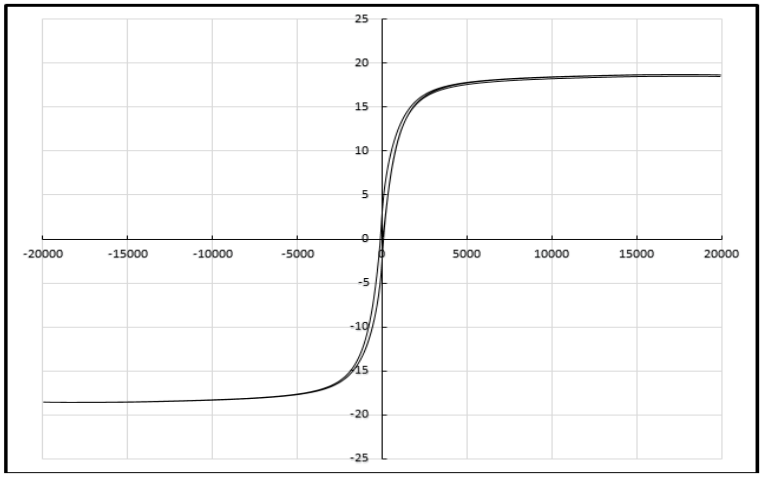
Narrow distribution within 15 um regime

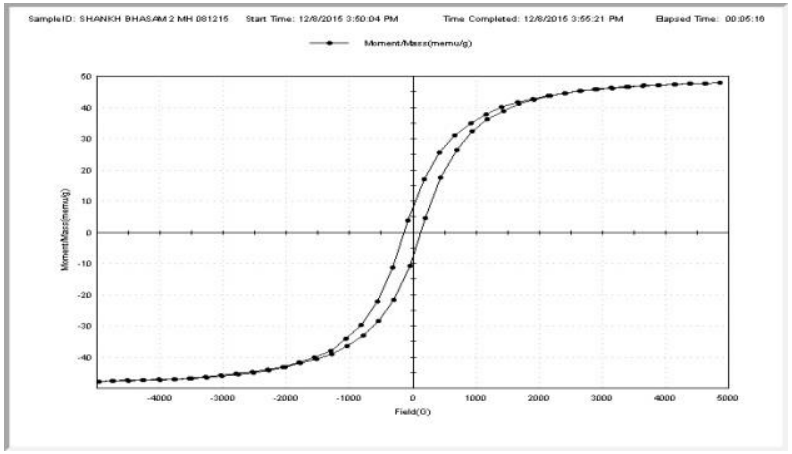
"It is apparent that Indians were fully conversant with the amalgamation technique and the superior reactivity of the fine powder thus produced by the 9th century AD

MAGNETIC NATURE OF BHASMA: FAVOURS MEDICINAL VALUES WITH OTHER APPLICATIONS IN TECHNOLOGY

REF-

- The magnetization, of this materials are found to be 18 emu/g for Tamra bhasam and 48 emu/g for Sankh bhasma respectively. Both the bhasma shows magnetic property . The magnetization saturates at low field which is a signature of soft magnetic nanomaterials. So, these materials also can be used for soft magnetic applications.
- This superparamagnetic property also favours any medicinal values of traditional medicine. As Magnetism which is an important element for almost all living organisms as its presence leads in a wide variety of metabolic processes, including oxygen transport, deoxyribonucleic acid synthesis, electrontransport and some others related biomedical functions.





Nano Ferrites : Engineering Materials

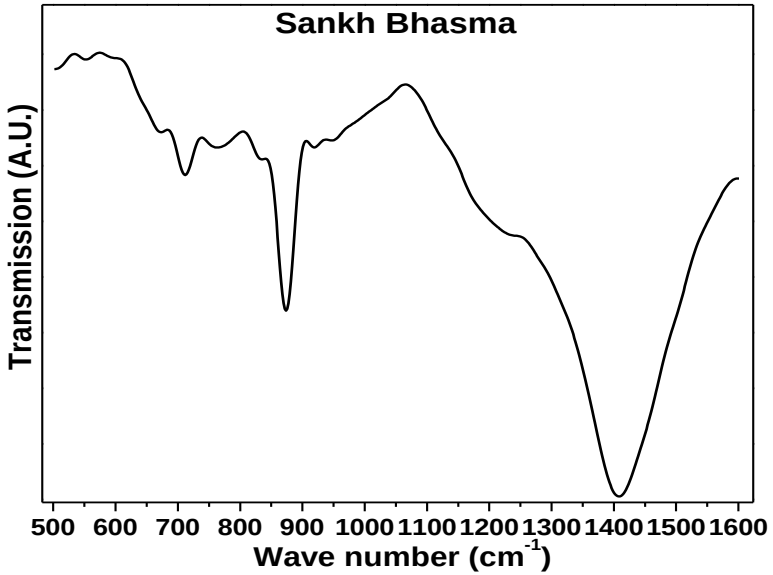
Magnetic Materials

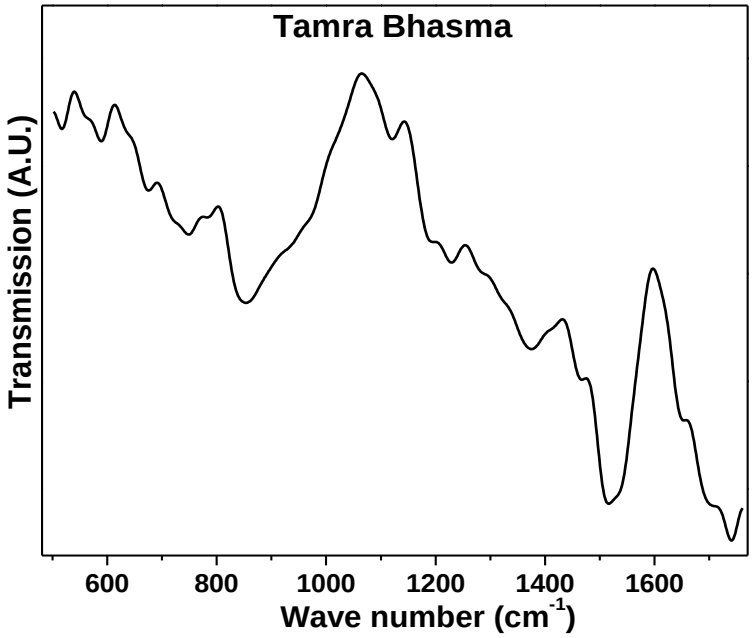
It has been estimated that in the world market 40% of the total magnetic materials is dominated by Ferrite. Possible applications of this materials are in Electronics industry, Purification of water, Biomedical imaging, humidity sensor, Cancer treatment etc. due to its Magnetic behaviour.

Functional Group Measurement

- ✓ In case of Tamra Bhasma, 800-700 Cm^{-} represent C-Cl bond stretching Vibration, The carbon oxygen stretching bond (C-O-C) vibration were found at 1200 cm-1 , number of inorganic groups such as sulfate, phosphate and carbonate were also observed at wave number below 1200 cm-1. The XRD data support the FTIR results.

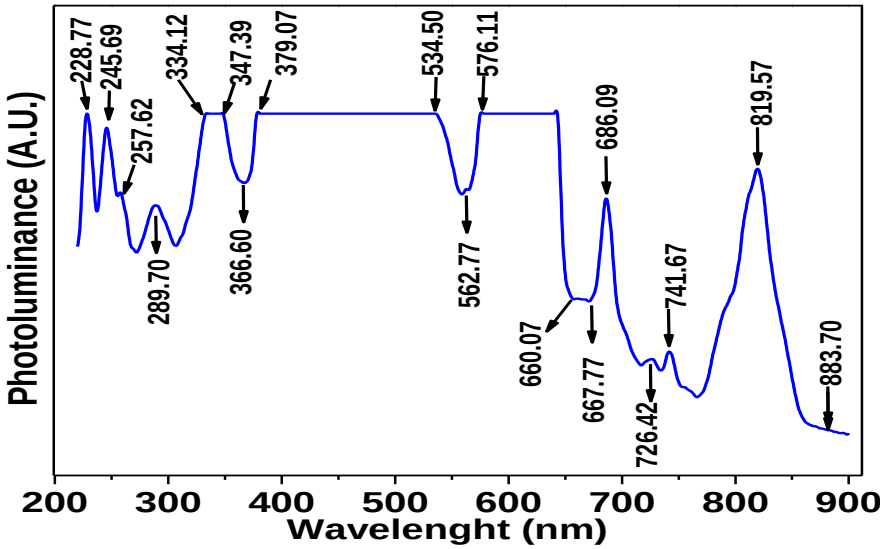
- ✓ In case of Shankh bhasma, a broad and deep absorption peak is detected at 1409 cm1.This peak due to the carbon oxygen bond. second intense peak is at 873cm1, which is the signature of strong bond of carbon with chloride and fluoride,

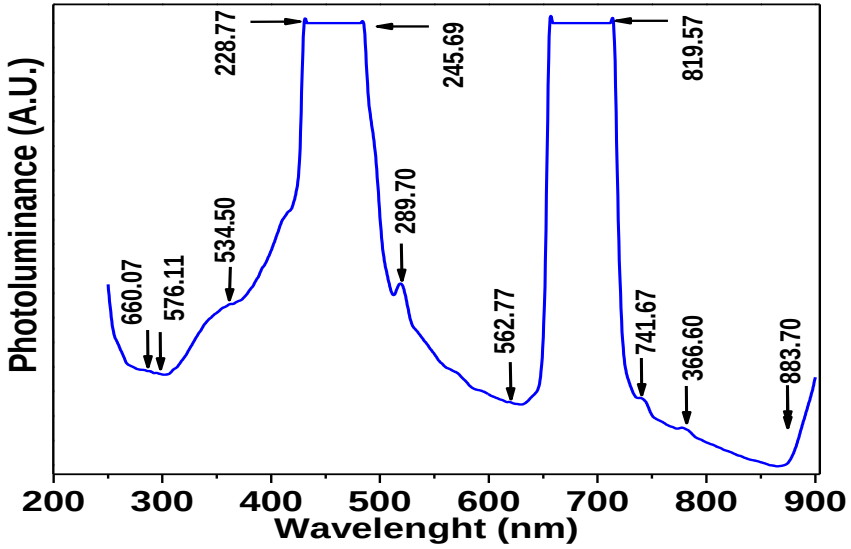




Luminescence Measurem ent using 200nm and 225nm excitation source

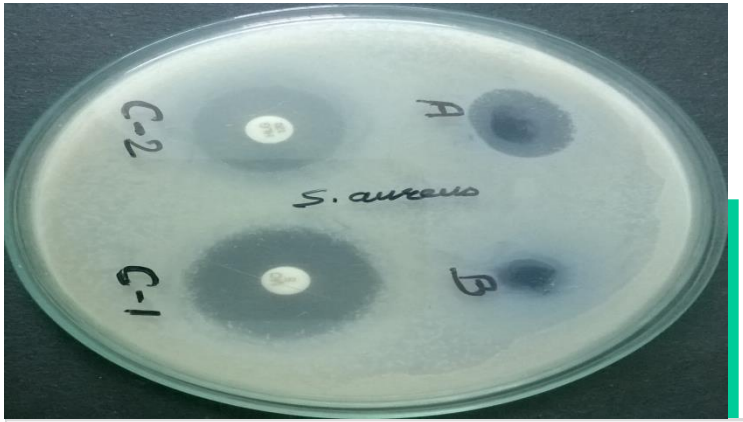
A characteristic luminescence spectrum is exhibited with 18 peaks with different intensities in UV, visible-NIR region through excitation of 200nm Laser source and 10 peaks using 225nm excitation source. Such luminescence may be due to presence of different chemicals as enlisted from XRD analysis

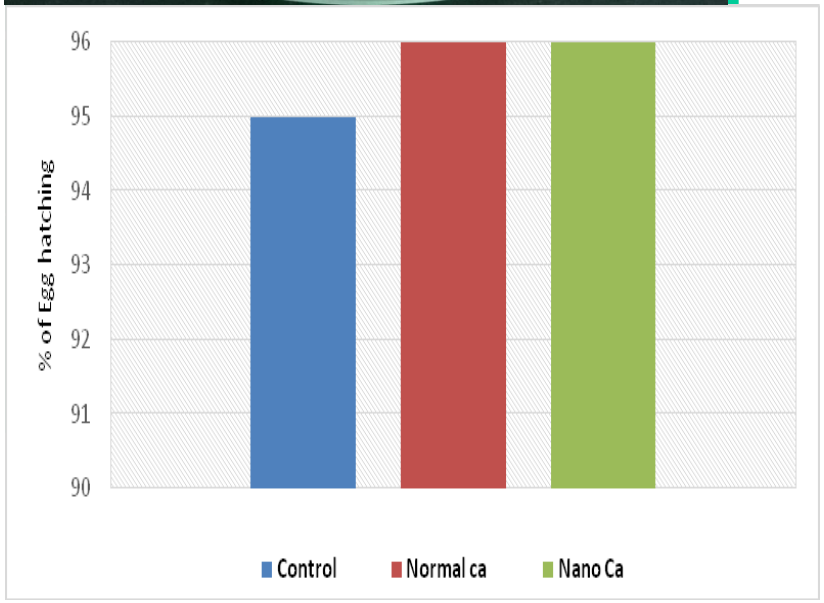




Biomedical Results of Ayurvedic Bhasma and Nanotechnology
Sanjay Kr, Ph.D. thesis, Guided by Dr. Rakesh Kr Singh, AKU, Patna

Antimicrobial tests, action on C.elegen etc. sresults shows that Lauh, Tamra, Shankh and Abhrakh Bhasma can be used as effective as a nanomedicine.Therefore Product with scientific evidence can be shaped as Ayurvedic Industry in state Bihar and India





After detail Discussion on

How is bhasma is nanocrystalline materials, quantum vibration of energy in hurb, interatomic distance- potential energy and stability of molecules, Scientific analysis and fundamentals of science of notable research contributions and exploring the ancient Indian wisdom- Ayurvedic Bhasma & Nanomedicine. & Feliciatated by Excutive Chairs

Prof. Hisatosi Kobayashi

National Institute for Material Science, Tsukuba, **Japan**

President- International Association of Advanced Materials **(IAAM)**

Future Planning

The humanity will benefit enormously if we could build a ' **Golden Traingle'** between **modern Science & Technology, Modern Medicine and Ancient medicine such as Ayurvedic bhasama.**

There is an urgency of meeting of minds- Scientists, medical practioner and Industries. Additionally, collaborations between ancient and contemporary medicine should be encouraged and more number of conferences should be conducted to create awareness.

It is noteworthy that the prices of the various bhasma are very reasonable compared to the cost of contemporary nanomedicine. Such related medicine can be available for mass people.

Repetition of case study, Biomedical studies and move for product/ patent. Thus Evidence based Indian origin medicine can solve various diseases and in others technological Applications. The beauty of this medicine is that preparation method is natural and Environmental friendly.

Youth must be made to understand the beauty of doing science, the pleasure of doing science, and the ultimate bliss when results of science make you understand nature, master it, control it, and finally make things that improve the quality of life of humankind.

'Science is a global business'

Interview with Senator **Kim Carr**, Australian Minister for Innovation, Industry, Science and Research.

After assuming office in 2007, the Labour Government in Australia instituted a separate Ministry for fostering innovation, for the first time in the country's history. Two years later, the government published a White Paper, titled "Powering Ideas," which reflected the understanding that research policy needs to incorporate a substantial role for international collaboration.

In this interview, done in Bangalore with **V. Sridhar**, *Senator for Victoria* **Kim Carr**, *a former school teacher for 10 years and now Minister for Innovation, Industry, Science and Research, outlines the challenges facing Australia, which have influenced the government's priorities for scientific research. Excerpts:*

You have followed science, innovation and research affairs during the last decade, first as a shadow Minister and later as Minister in the Labour Government. What are the key elements of Australia's strategy of fostering innovation?

My portfolio brings together university research, science and business innovation for the first time in Australian history. It is aimed at building on our strengths. We understand that we are working in an international context. What we do in the economy is linked to what we do as a society.

The key issue is about improving the living standards of our people. But we are also trying, through international cooperation, to assist other people to build their standards of living. Also, the social agenda is as important as the economic agenda.

How has the ordering of your priorities been shaped by your understanding of the areas in which Australia is strong, and of areas in which you need to develop partnerships with other countries?

We want to collaborate in all areas. We do not discriminate between areas of research. We will encourage our best and brightest to work with the best and brightest in other countries. The big problems facing humanity — climate change, the problem of ageing [populations], the global problem of food or water security — are such that no one country can ever hope to solve [them] by

KIM CARR: *"With Indian scientists and institutions we are talking about nanotechnology, biotechnology, water conservation, and astronomy."* — PHOTO: K. MURALI KUMAR

Our fundamental premise is that you need constant improvement if you want to maintain the quality of life at a certain level. No society can survive on the presumption that the status quo is good enough. Only societies that are capable of profoundly questioning themselves will be able to build better living standards. The key to innovation is problem-solving, identifying ways of improving indigenous communities, we need to do a lot more. Despite our weaknesses, we have done well in supporting people through change.

The structure of the Australian economy has changed dramatically in the last 30 years; it is going to change a lot more in the next 30 years. We have to provide support to enable people to move to new jobs. We need to ensure that people are

the answers — not even by the U.S., the most powerful country of the world. The scientific method is predicated not on the individual, but on teamwork and the sharing of knowledge, despite all the fantasies of Hollywood.

Australia produces three per cent of the scientific papers published worldwide. Our scientific contributions may be disproportionately large when compared to our share of the global population, but that is not good enough.

With Indian scientists and institutions we are talking about nanotechnology, biotechnology, water conservation and astronomy — we have a broad engagement. The Australia-India Strategic Research Fund, which started in 2008, has a contribution of A$65 million from our side, with an equal amount committed by the Indian counterparty, the Department of Science and Technology. We have spent A$31 million so far on 9 projects in India and Australia.

You have an MoU with the Indian Space Research Organisation (ISRO), which is due for renewal. What have been the achievements of this collaboration?

Neither country at this time has the capacity to launch a manned space vehicle. It is more about collaboration on spatial technologies. In particular, it is about having a better understanding of earth observation systems, especially in relation to climate change. It also includes other areas, such as understanding the oceans, issues relating to geology and monitoring natural disasters. We are also working with NASA, and the European and Japanese space agencies along similar lines.

Our collaboration with ISRO complements these other engagements. The beauty of it is that we have much to contribute because of our geographic location.

What has been the progress in the Square Kilometre Array (SKA) project? What is India's contribution?

The decision on the siting of the project — whether it will be in Australia and New Zealand or southern Africa — will be taken next February. We welcome India's entry with an observer's status on the governing board of the project. Two Indian institutions — the Rama Research Institute [in Bangalore] and

Thank you