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Preparation and Characterization of Metal Oxide as Nano Particles - Varatika Bhasma

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Keywords: nanoparticles, metal oxide, herbomineral formulation.

ABSTRACT. Varatika bhasma is a herbomineral formulation coming under the holistic concept of Ayurveda. Varatika is the outer covering shell of marine organism *Cypraea moneta Linn* or commonly known as Money cowry. Chemical composition of Varatika is Calcium carbonate. The present study involves the processing of varatika in to metal oxides by a special process known as Bhasmikaran in Ayurveda, the ancient system of medicine. Varatika is subjected to calcination there by the Calcium carbonate present in varatika is converted fine particles of calcium oxide, producing potent, biosafe and efficacious nanoparticles with less side effects are produced. The evaluation of the final product are done for physicochemical parameters and by sophisticated analytical tools like Xray, SEM, AFM, Zeta potential EDAX, particle size analysis and by Thermogravimetric curves. The produced bhasma was found as very fine nano particle which may produce very potent and biosafe antiulcer activity.

Introduction: Ayurveda is an ancient system of medicine where natural materials are used as remedies for a large no of diseases and the system is based upon the balance of spiritual mental and and physical functions of human body. A large number of formulations are available in ayurvedic system. Out of this 35-40% contains minimum one metals as major ingredient. A branch of Ayurveda known as *Rasoushadi* includes a class of ayurvedic medicines containing metals. Bhasma are coming under rasoushadies as they are herbo-metallic ashes prepared by repeated calcination of metals with various herbal ingredients to form organometallic complexes [3] These process known as Bhasmikarn converts metals in to metal oxides of nanosize having unique electrical, optical catalytical and medicinal properties. These formulations are very very important because of their uniqueness like alpamathra (a low dose), non toxicity, good palatability and potent and fast acting and with the ability of targeted drug delivary. In this present study Varatika bhasma is prepared from the outer covering of the marine organism *Cypraea moneta Linn* or commonly known as Money cowry. This is mainly used for its antiulcer property as it contains calcium carbonate. Varatika is subjected to bhasmikaran process whereby the organic components are eliminated and metals are converted to its high oxygenated state. The repeated heating reduces the particle size to nanosize whereby nano medicine with increased metabolism at cellular level because of its high zetapotential and rapidly acting, nontoxic less side effects producing herbo mineral formulation Varatika Bhasma is obtained. This study also attempts to characterize the varatika bhasma prepared by physico-chemical properties through conventional methods like Nischandratvam (lusterless), Apunarbhava (metal irreversibility test), Varitaratvam (floating test) and by physicochemical parameters and using modern analytical methods like scanning electron microscope (SEM) and X-ray fluorescence (XRF) spectrophotometer [2-5].

Experimental

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Bhasma Preparation. The Varatika is subjected to Bhasmikaran process which is the most important step which determines the effectiveness of bhasma. All the metal part has to be converted to oxide form during this step. Any metal not converted to oxide form will remain as such and can be detected in evaluation process. Materials: varatika and Aloe vera juice are obtained from local market of Nilambur, Malappuaram, Kerala and Cow dung-from local people.

Methodology

1. Authentication: Authentication is done by HOD, Rasoushadi Department, Pariyaram Ayurveda Medical College, Kannur, Kerala

2. Purification of Varatika

3. Varatika Bhasma Nirmanam

3.1. Varatika Shodhana- 50 gms of varatika which is authenticated is taken and subjected to shodhana. Shodhana involves powdering of Varatika in to small pieces and then it is tied in to two folded cloth and it is made to hang on a stick placed across a pot which is filled with kanji (a sour liquid). Then it is subjected to heat for 3hrs. After three hours it is taken out and washed in warm water and dried. Varatika must immerse fully in to the kanji while heating.

3.2. Marana (Bhasma Nirmana)-Purified varatika is taken and kept in mud vessel then covered by another vessel. The mouth of vessel is covered tightly by a cloth which is smeared with gopichandanam (A type of mud). Cow dung cakes are used as fuel. Vessel must be placed over the cow dung cakes and set the fire. After the combustion the vessel is taken and varatika must be collected. The same procedure is done for 3 times after making it in to a paste by adding aloe vera gel Which is known as Putta. The no of putta determines the quality of Bhasma. These process convert the minerals and metals of varatika in to very fine powders of nano size and thus more effective and less toxic materials are obtained as shown in Fig.1[1]

Evaluation of Prepared Bhasma. The prepared Bhasma has to be Evaluated for assuring the effectiveness, quality and safety. They have evaluated by following methods

Physical Standardization. Traditional method of characterization has done by following methods. Verna: The colour of bhasma is checked. It was found light ash color. Niswadhutha: Taste of bhasma was checked by keeping a pinch of bhasma on tongue. Nischandratvam: A pinch of bhasma is observed under bright light. it was found without lusture. Rekhapurnatwa: Fineness test, by rubbing bhasma in between the fore finger and thumb. as bhasmas are fine they will enter in to the furrows of the fingers. Floating test: Pinch of bhasma was over the surface of water. It was found floating, indicating lightness of bhasma.

Physio Chemical Standardization Ash values, XRD, SEM TG CEDAX analysis are carried out to study the physical chemical compatibility (1)

Atomic Absorption Spectroscopy (AAS): AAS analysis carried out as per the reference (3, 5-8).

Result and Discussion. The Varatika Bhasma was prepared as per the Rasatharangini, an official ayurvedic text. The metal calcium present in the Varatika has converted in to a higher oxidation state, as calcium oxide and the nano sized fine ash are produced. The heating at higher temperature burns out all carbonaceous matter and the nanoparticles formed has improved physiochemical and biological properties. The Evaluation method shows following results. Nischandratvam: Found without Metallic lusture. Rekhapurnatwa: Fineness. As bhasma produced are fine they will enter in to the furrows of the fingers. Floating test: It was found floating, indicating lightness of bhasma. These results shows that the bhasma prepared are in very fine form. Fig. 2, Fig.3,

Physiochemical Standardization: Ash values obtained are given in Table 2.

XRD Analysis The pattern obtained in Fig. 5. The size of the crystals formed are calculated by Scherrer formula and the size lay in the range of 80nm-117nm. SEM The particle size are nearly 659

nm which gives insight that the method of preparation ie the no. of calcination, Fig.6. TGA-The TGA analysis curve shows the decomposition temperature of 736.7°C , which shows that the bhasma contains pure calcium oxide.

EDAX Analysis The stotiometry of particles is studied by EDAX. The results are in Fig. 8. and the other heavy metals are within the limits of official books. The results are shown in Table 2. All these analysis confirms the nano nature of the varatika bhasma and this oxygen deficient state improves the therapeutic activity. Further animal experiments are required to confirm bioactivity.

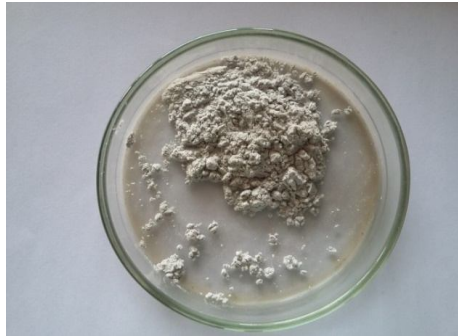


Fig. 1. Physical properties for Shankha Bhasma.

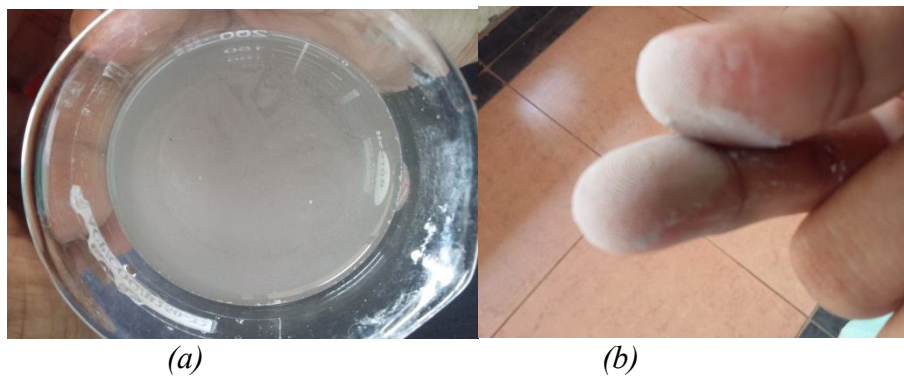


Fig. 2. Fineness test for Shankha Bhasma.

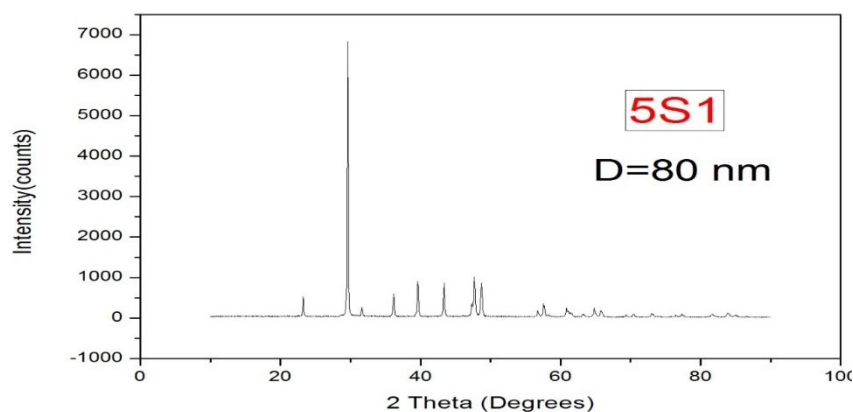


Fig. 3. XRD Analysis of Shankha Bhasma.

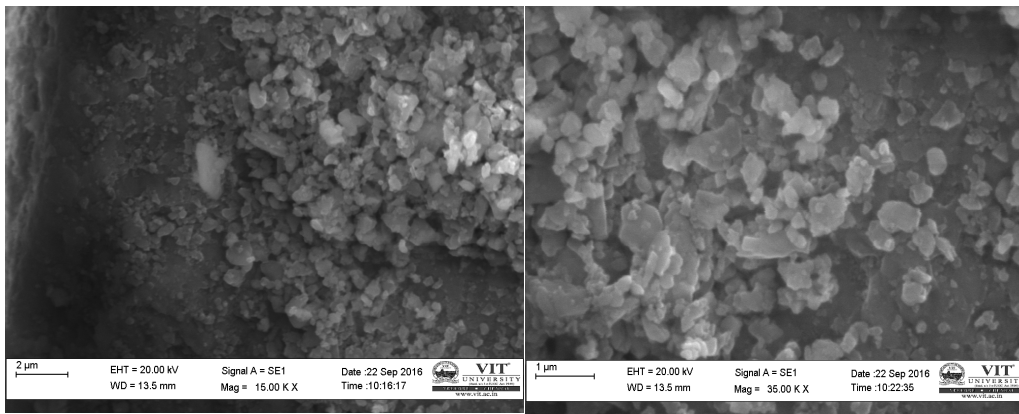


Fig. 4. SEM images of Shankha Bhasma.

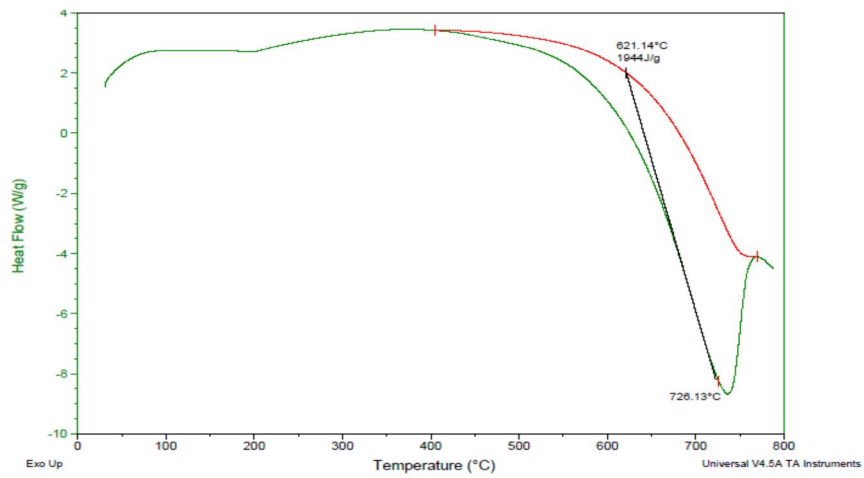


Fig. 5. TGC curve for Shankha Bhasma.

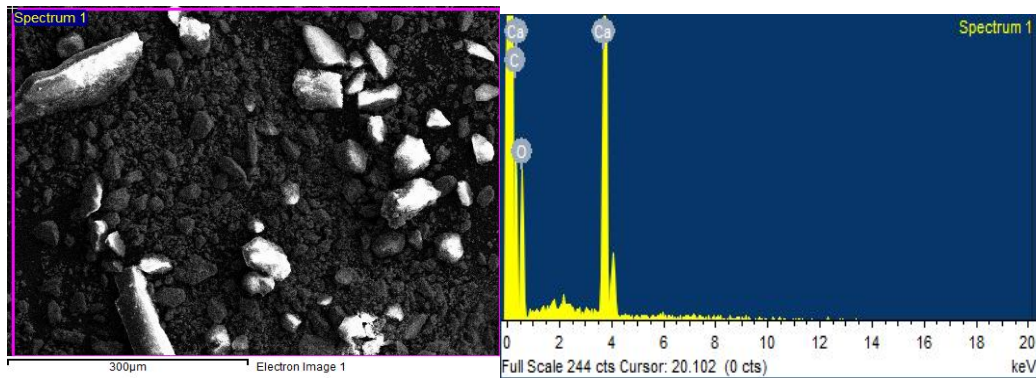


Fig. 6. EDAX images of Shankha Bhasma.

Table 1. Preliminary tests for Varatika Bhasma.

Sno	Test	Values
1	Total ash	78.06%
2	Acid insoluble ash	9.83%
3	Loss on drying at 105 ^o C	0.6577%

Table 2. AAS results of Varatika Bhasma.

S.N	Element	Concentration	Absorbance
1	Zinc	0.6219	0.1214
2	Cobalt	1.129	0.0119
3	Cadmium	0.298	0.0206
4	Copper	0.534	0.0012
5	Lead	4.76	0.484

Summary.The naturally obtained varatika has converted to nano sized particles by effective specialized product Bhasma. There by efficacious nontoxic formulation with better quality is obtained The nano character has evaluated byXRD, EDAX and SEM analysis and also by conventional and modern parameters. Varatika Bhasma is a traditional antiulcer Bhasma and the standardization reduces toxic effects and gives dose control and improves effectiveness.

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