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The Bhasma – A Organometallic Compound

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ABSTRACT

Bhasma which is an ancient medicinal trend is a beautiful gift of Ayurveda given to the humankind. Bhasma is a well-known potent preparation of Ayurveda which literally means 'ash'. These are unique metal base preparation which are well known in the Indian peninsula since hundreds of years and broadly

INTRODUCTION

Nano materials are readily finding their way in the medical field owing to their huge exterior locale and minute size by which they get easily absorbed by the cells and specificity to the target can be attained as preferred. Current TEM and element dimension investigation of many bhasmas samples exposed that Bhasmas are in nano size in measurement. Hence, Bhasma may be considered as nanomedicine. The present era is the era of suggested for treatment of a variety of persistent diseases and discomforts. Animal's body parts such as shells, horns, metallic, feathers, nonmetallic and herbs are in general given as Bhasma. Bhasmas are made by erudite pharmacological procedures integrating herbs and altering them into suitable form.

nanotechnology which is at present engaged as an instrument to discover the different areas of medicinal sciences like imaging, sensing, medicine deliverance, gene delivery system and imitation installations to name a few [17]. It has been the focus of considerable attention in medicine due to the ease with which the drug in the form of nanoparticles, intermingle with the human body at the smaller size [18]. Ever since the discovery of nanotechnology, there has been considerable research oriented towards the fusion of nanoparticles. There are a number of catch-ups for the fusion of nanoparticles as mentioned in Figure.



Correspondence to: Avani Pareek, Department of Chemistry, Jaipur Engineering College and Research Centre, Jaipur, Rajasthan, India Alteration of metals into Bhasma is an exclusive method mentioned under Rasashastra [6]. Bhasma (ash) is brought forth through burning; the initiating objects undergo an intricate procedure of decontamination and this process is followed by the reaction phase, which involves assimilation of some other mineral and herb extricates. The output of such a process is a fine powder, called Bhasma, which is used either alone as a drug or in amalgamation with other herbal extracts. Bhasma is an incinerated preparation in which the gem or metal is converted into ash. Bhasmas are claimed to be physically produced nanoparticles, which are prescribed with several other medicines of Ayurveda. So Bhasmas are multifaceted organometallic mixtures of metals or minerals got by repeated ignition with different Medias, and are well known for its efficiency, minor doses and long shelf life.

Also, the nano particles in the appearance of bhasma have found to have an advantage over other preparations in terms of their steadiness, lower dose and easy accessibility. In this way, the use of metals and minerals in the form of bhasma particles became the power of Ayurveda.

Steps of Bhasma preparation

1. Concept of shodhana

The process of Shodhana is designed for the very alteration of the original properties of a substance and also to induce new properties in it. Substances like Parada, Gandhaka, Gairika, Kampillaka, Visha-Upavisaetc are treated and handled more gently than the tougher substances like Abhraka, Loha, Tamra, Maksika, Naga, Vanga, Yasada etc. which are exposed to more

2. Samanya Shodhana:

It is used as general process for Shodhana of all drugs of a particular group.

3. Vishesha Shodhana:

VisheshaShodhana to be carried out after Samanya Shodhana, Vishesha Shodhana of Yashada in Haridra Churna and Nirgundi Swarasa.

Concept of Nirvapa: Heating the metallic substances till red hot and quenching them into the water or any other liquid is known as Nirvapa. Nirvapa is also called as Nishek and Swapana [14].

Concept of Dhalana: The basic pharmaceutical process here is melting of the metal and pouring it in a liquid medium at

Correspondence to: Avani Pareek, Department of Chemistry, Jaipur Engineering College and Research Centre, Jaipur, Rajasthan, India Preparation of bhasma as mentioned in the shastras has its own intrinsic process. According to the experts of these shastras, the process of preparation should be strictly followed to get the exact component. It means all these metals with plant and herbal extracts added to it, should be prepared with the same lengthy process propounded for it and incinerated in the same manner as mentioned in the shastras. The bhasma is the incinerated state of metals which is prepared taking a lot of care to remove the metallic qualities of the original metal and transform it into nano size particles, which makes it to adopt medicinal qualities and used for treatment of human beings [12].

This result in the metals to lose its metallic qualities and toxicity and change into such compounds which have medicinal and healing qualities of very high grade which when taken as medicines by human beings is absolutely safe and works as a curative drug without any side effects. Bhasma are professed to be organically fashioned nano-particles, which are given with several other drugs of Ayurveda.

rigorous activities. The Shodhana procedure described in classics of Ayurveda is not simply a process of separation, purification or detoxification. Rather it increases the therapeutic strength of the drug also.

Classical Definition:

Discarding impurities from raw drug by various processes like Mardhana, Svedanaetc by addition of prescribed drugs is known as Shodhana [12].

Actually when the hot mineral or metal in any existing state is being immersed in the liquid a drastic change in temperature occurs which may be resulting into sudden reformation of grains of much smaller in size, simultaneously entrapping the liquid in between the grains, in which it is being quenched.

This liquid then forms the liquid grain boundary films, which in metallurgical form of view are very harmful to the properties of a metal but are very favorable for the discipline of Rasa Shastra. On the contrary, it is one of the main aims for which this primary process is carried out. Further repeated heating and successive quenching treat individual reduced grains as separate entities and further reduces the grain size. This may have been the reason for specification in the number of quenching for a particular metal / substance or for a particular liquid used as a medium.

room temperature, termed as Dhalana. It mainly comprises of 2 stages [9].

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During 1st phase while heating metal, lower most layers of the metal starts to melt. Then gradually upper most layer of the metal melts. During this procedure certain elements which are volatile in nature may get eliminated from the metal. During the melting stage metal may react with the surrounding atmosphere and forms some desirable compound. In Rasashastra, for every processing, a particular heating pattern is indicated. It must be followed to attain the preferred change in the matter. And in the case of process of Dhalana, heating to complete melting stage is very important, because in melting stage only desired changes in the metal can be achieved. In second phase as the melted metal is immediately poured in liquid, the grain boundaries get filled with liquid and crystalline structure gets broken.

Concept of Bhavana: The procedure of steeping the powders of Dhatus and herbs with liquid substances like Swarasa,

Preparation of Mukta Shouktic bhasma

Dubey et al. had prepared biomedicine Mukta shouktic bhasma (MSB) through special calcination of mother of pearl.

Shodhan: The mother of pearl fragments was gently crushed to smaller fractions by means of an agate mortar and pestle. Pieces of mother of pearl were first cleaned with hot water to remove dirt material. The mother of pearl fragments were then immersed in lemon juice (nimbus swarasa) and boiled for 90 min in a specially prepared hanging sealed earthen pot (dolayantra). This process was known as boiling (swedana). The solution was filtered off to get the cleaned mother of pearl fragments (shodhit mukta shouktic), which were subjected to first calcination. For calcination the cleaned mother of pearl fragments were placed in sealed earthen pot (sarava samputta) and subjected to ignition in a traditional furnace (gaja-puta). The stable intermediate can be stored in sealed earthen pot until further use. Bhavana: The intermediate obtained after the first calcination was then treated with Aloe vera gel and triturated using an automated mortar and pestle at 1000 rpm. The total time of trituration was 8 hrs. The mixture was pressed in the form of cakes (Chakrikas) and dried in the shade for 48 hrs. These dried cakes were immediately subjected to further processing, Marana the cakes were calcinated to obtain the intermediate. The procedure was repeated two times.

Kwatha, Taila, Ghrita etc. followed by trituration in Khalvayantra to dryness is known as Bhavana [3]. Bhavana has various definitions throughout the texts, varying on the amount of liquid used and the time required to be allocated for the same.

Standardization methods used for the Preparation and Characterization of Some Bhasma

The following section discusses the various standardization methods followed by researchers over the years for the preparation and characterization of some bhasma. Recent literatures have shown that researchers have identified the importance of modern analytical methods for quantitative evaluation of the formed bhasma particles, although the classical methods of evaluation called the bhasma pariksha cannot be ignored as they help in qualitative evaluation of bhasma particles. A combination of both the methods could be very handy in identification of proper bhasma particles.

Physicochemical evaluation of the synthesized biomedicine using XRD established the existence of calcite as the major crystalline phase in the sample, while TG readings showed steady weight loss up to 43% between temperature 800 and 900°C due to gradual conversion of calcium carbonate to calcium oxide. DLS showed that size of MSB particles ranged between 1.22 and 10.20 µm having a mean particle size of 22.52 ± 0.45 µm. 6% of the particles were also found to have a particle size less than 50 nm. TEM showed that the particles are irregular rod shaped. The TEM photomicrograph of MSB showed the appearance of 15-50 nm particles in the sample. SEM showed the morphology of MSB samples to be remarkably different from that of standard calcite. This simply means that repeated calcinations cycles were necessary to stabilize the particles to a minimum particle size. The element analysis through ICP and EDAX exposed the existence of heavy metals like chromium, lead, and cadmium in MSB. Other heavy metals like arsenic, mercury, and tin were below the detection limit of the ICP analysis. TGA analysis showed weight loss up to 600°C, which may be credited to the loss of moisture content of the crystal. A gradual weight loss up to 43% w/w was also observed between 800 and 900°C due to gradual change of calcium carbonate to calcium oxide.

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Preparing of Naga Bhasma [17]

Nagarajan et al. had equipped the Naga bhasma using the subsequent technique:

Shodhana involved the quenching of metal thrice successively in Tila taila, butter milk, cow's urine,Kulattha kwatha and kanji.Jarana is for comverting metal into powered form. In Mrana process incineration take place.

Physicochemical valuation through TGA explained that Naga bhasma sample was thermally stable until 900°C which showed the nonexistence of free organic molecules. FTIR analysis showed that the entire sample contains organic moieties as intricate particles. Particle size analysis was done to regulate the particle size and pore volume of Naga bhasma. Surface area analysis was carried out to check the presence of micron size particle and to find out the specific surface area of Naga bhasma. EDAX has done to check the existence of arsenic along with lead. Electron microscopy study confirmed the bhasma content particle in micron and sub-micron range. XRD study showed that lead was existent in lead oxide phase.

Preparation of Lauha bhasma [12]

Pavani et al. had synthesized Lauha bhasma using iron particles as a pioneer material.

DISCUSSION

Zinc plays a very important role in human body. Zinc has only single oxidation state i.e. Zn²⁺ and it is found in more than 300 enzymes, present in all six classes of enzymes characterized by the International Union of Biochemistry. Zinc is very impertinent element for all physiological processes in human body, as it plays vital role in cell functioning, boosting immune system, promoting wound healing, control diabetes and regulates many more functions in human body [8]. Zinc prevents the degradation of insulin and makes receptors suitable for the binding of insulin [11]. It plays an important role to prevent diabetes mellitus; Apart of this Imbalance of zinc in human system causes appetite loss, eye and skin lesions, and weight loss. Also, zinc deficiency causes anemia, low insulin level, as it is slowly absorbed by body.

This deficiency of zinc cannot be fulfilled by taking zinc metal directly, as their direct consumption might create harmful side effects in human body. It is well- known fact that direct consumption of metals is not suitable for human body as they have some toxic effect themselves.

Correspondence to: Avani Pareek, Department of Chemistry, Jaipur Engineering College and Research Centre, Jaipur, Rajasthan, India Standard cleansing and particular decontamination are modern synthesis techniques which were used to produce final product, Lauha bhasma. Samanya shodhana: It involved three sub steps: In the first step of cleansing procedure, 40 grams of iron filings were taken in a beaker, using 20 ml of sesame oil as quenching medium, submerge for 30 minutes and filter by Filtration setup. Then so obtained filtrate was heat treated at 530-560°C for 30 minutes by which the filtrate was completely dried. Each of the quenching process was frequented for seven times with each treating liquid, by using Fresh medium every time. Special Purification: The product obtained from normal refinement was taken in a beaker and submerged in 20 ml of panchgavya for 24 hours. It was then washed with panchgavya for 6 times by filtration process.

Physicochemical evaluation through XRD analysis showed transformation of iron oxide from α - to γ - phase and this γ -phase remains constant, that indicated the FCCconfiguration for FeO nano particles. FTIR spectra indicated 3 dense peaks, the spectra displayed broad absorption around 3733.83 cm⁻¹ was assigned as OH stretching, H-O-H bonding at1632.56 and the main Fe-O stretching was observed at 577.94 indicating the presence of iron oxide nanoparticles. TEM analysis indicated presence of well dispersed and perfect cubic structure of the sample and the occurrence of round configuration of iron oxide nanoparticles.

It may be noted that for its suitable consumption, they are formulated by proper incineration process as mentioned in classical texts, as improperly incinerated bhasma causes adverse effects in human body. Different steps (Shodhana, Jarana, and Marana) of preparation of bhasma not only remove the impurities present in the metal but integrate much medicinal property which renders them suitable for treatment of many ailments.

After the preparation of bhasma, characterizations are done to confirm the formation of these bhasma particles. Characterization of bhasma particles has to be done by classical, Physical and modern methods of analysis. Yashada bhasma may be prepared using various methods and raw materials as per texts laid down in many literatures. These may vary from one manufacturer to another as described in the Ayurvedic text books [51]. It is needed to deduce the chemical composition, check upon the physical properties and structure of these bhasmas which after its complete preparation eliminates the toxicity present in the metal resulting in giving excellent medicinal effect to the human body.

In this work, Yashada bhasma has been prepared by three step process i.e. Shodhana, Jarana and Marana. During Shodhana process, for frequent warming and reducing of zinc metal, different acidic and basic liquid media were used. The alternative melting and quenching of zinc metal in these liquid media not only deforms their external surface but also change

Results

1. Results of Ancient characterization

Ancient characterization like Varna, Taste, Nishchandrata, Varitara, Nirdhuma and Rekhapurnata of all samples.

the chemical and physical nature of metal. Thus during the shodhana process, metal may get free from impurities and change into blackish and coarse powdered form, due to partial oxidation of zinc during the melting process [15].

2. Results of Physical characterization

Physical characterization of bhasma samples like Complete Powder value, Acid Unsolvable ash, Water soluble ash, Loss on drying and pH value of all samples are shown in Table 31.

Sample	Varna (Color)	Niswadu (Taste)	Nishchandrata (Lusterless)	Varitara (Lightness)	Nirdhuma (Fumes)	Rekhapurnata (Fineness)
BYB1	Yellow	Tasteless	No luster	Positive	No fumes	Positive
BYB2	Yellow	Tasteless	No luster	Positive	No fumes	Positive
СҮВ	Yellow	Pungent	No luster	Positive	Mild fumes	Positive
OMM	Creamish	Tasteless	No luster	Positive	No fumes	Positive
Samples	Total Ash Value	Acid Insoluble Ash	Water Soluble Ash	Loss on Drying	pH value	Samples
BYB1	95.20%	62.33%	9.55%	0.78%	9.23	BYB1
BYB2	96.13%	66.21%	11.78%	0.80%	10.00	BYB2
СҮВ	85%	67%	15%	2.5%	11.00	СҮВ
OMM	99.76%	46.10%	1.66%	0.01%	8.58	OMM

Table 1. Ancient and Physical characterization of BYB1, BYB2, CYB, OMM

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