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Qualitative assessment of *Swarnamakshika Bhasma* (Copper Pyrite) using Nambhuri Phase Spot Test

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ABSTRACT

Swarnamakshika is one among *Maharasa* (Great minerals), on reviewing the *Ayurvedic* classics, it is evident that therapeutic use of *Swarnamakshika* (Copper Pyrite) has been in practice since *samhita kala* (300B C- 600 B.C) period. *Swarnamakshika* (Copper Pyrite) used since time immemorial in treating various diseases like *pandu* (Anemia), *kushta* (Skin ailments), *prameha* (Diabetes) and it is best *Rasayana* (Immuno-modulatory) etc. *Swarna Makshika* (Copper pyrite) is the most abundant copper bearing mineral. *Swarnamakshika* (Copper Pyrite) was prepared according to the Ayurvedic classics and subjected to various *bhasma parikshas* (Powder test) as explained in *Rasashastra* (Indian Alchemy) text and also including the Namburi Phased Spot Test one of the qualitative tests described for various Ayurvedic preparations of *Bhasma* (Powder). NPST helps differentiate between purity of the sample, and thus identify, various bhasmas. It depends upon the pattern of the spot, which develops after a specific chemical reaction. Sample of *Swarna Makshika Bhasma*, (Swarnamakshika powder) which was tested with NPST the bhasmas (Ashes) prepared in our college, produced the most accurate results.

Key words: NPST, *Swarnamakshika Bhasma*, *Copper pyrite*, *Namburi Phased Spot Test*.

INTRODUCTION

In Indian chemistry the minerals of medicinal value are classified as *Rasa*, *Maharasa*, *Uparasa*, *Sadharana rasa* (Group of minerals), etc. Every member of these different groups, after purification and conversion into a colloidal form, may be used individually and independently or in a combined form. The members of the *Maharasa* group specially have their

importance and their *Bhasmas* (Ashes) are used independently and their use of compounds also exists. *Swarnamakshika* (Copper Pyrite) is one among *Mahararas* (group of mineral), which has given very much importance in both *Dhatuvada* (stage of conversion of lower metals into higher metal) and *Dehavada* (stage of medicine preparation). It is a compound of copper, iron and sulphur along with so many toxic admixtures. *Swarnamakshika* (copper pyrite) in its bhasma form offers an improved state of *Tamra bhasma* (copper) pretreated by *Gandhaka* (sulphur) and *Louha* (iron) in its original form. It has been explained that if used without *shodhana* (purification) causes *Akshivikaras* (eye disease), *Mandagni* (undigestion), *Kushta* (Skin ailments) etc. disorders. Hence *shodhana* (purification) is necessary for it. Branch of Ayurveda However, in this competitive, commercialized world the quality of a *bhasma* (ashes) is always open to question to us. For *bhasma* (ashes) quality assessment, various *bhasma parikshas* (tests) have been described in our

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Rasashastra (Indian Alchemy) classics. The Namburi Phased Spot Test (NPST), a spot test based on a chemical reaction, is a new technique for assessing the quality of a prepared *bhasma* (ashes). When a drop of clear solution of a substance under examination (*Bhasma* or *Sindhura*) is put on specially prepared chemical reacting papers, a spot appears (*Sindhura*) which manifests a series of color and pattern changes. In chemistry, techniques involving spot tests or chromatography are widely used. The NPST involves observations of the spot and its color, at three successive phases spread over three different time intervals. It thus has the advantage of measuring sensitivity of reactions at different time intervals. In other words, it constitutes a method to study or detect, every second or even fraction of a second, continual chemical reactions taking place gradually between two chemical substances on static media. The technique was developed and standardized by Dr. Namburi Hanumantha Rao in 1970, it has been accepted by CCRAS, New Delhi. NPST and other classical tests were performed on samples of *Swarnamakshika bhasma* the first prepared classically using *Gandhaka* (sulphur) and *Swarnamakshika* (copper pyrite) triturated with *Jambhira swarasa* (citrus medica juice) 5 Varaha Puta are given.^[1] The *bhasma* prepared in our department shows the most accurate spots in Numbhuri phase spot test.

MATERIALS AND METHODS

A three-part methodology was used for this study

- Obtaining samples of *Swarnamakshika bhasma* first prepared classically as explained in *Rasashastra* (science of mercury) text.
- Subjecting sample to classical *bhasma parikshas* (ashes tests).
- Subjecting sample to NPST

Swarnamakshika bhasma preparation classically

The Raw *Swarnamakshika* was collected from (Hindustan Copper Ltd.) Khetri Copper Complex Khetri Nagar Rajasthan. It was having all *grahya lakshanas* (acceptable variety for the study) told in the classics. The Raw drug was confirmed by Quantitative analysis

for Copper, Iron, and Sulphur using Atomic Absorption Spectrophotometer study

Shodhana (purification) of *Swarnamakshika* (copper pyrite)

Powder of *Swarnamakshika* (copper pyrite) was taken in an iron vessel. *Erand Taila* (Castor oil) was added to it and mixed properly. Then this iron vessel was kept on a gas stove for heating *agni* (fire) is in *tivragni* (intense fire). The mixture was then continuously stirred with the help of a small *darvi* (stirrer) throughout the procedure. Heating was stopped when the bottom of an iron vessel attained red color and all sulphur fumes stopped. Then the mixture was washed thoroughly with the hot water for two times and kept spread for drying on a clean cloth.^[2]

Table 1: Showing the color change of *Swarnamakshika churna* during *Bharjana* (Frying).

Procedure	Appearance
Before Shodhana	Warm gray
After addition of <i>Eranda Taila</i> (Castor oil)	Light gray
After 5min addition of <i>Eranda Taila</i> (Castor oil)	Greenish gray
After 15 min of heating	Blackish gray
After 40 min of heating	Blackish gray red color

Marana of *Swarnamakshika* (Inceneration of copper pyrite)

Finely powdered *shudda Swarnamakshika* (purified copper pyrite) was taken in a *Khalva yantra* (mortar and pestle). Then equal quantity of *Shudda gandhaka* (purified sulphur) was added and triturated together till they become homogenous. To this mixture 100ml of *Jambira rasa* (citrus medica juice) was added triturated well till it becomes semisolid consistency. The paste were made into shape of *chakrikas* (round like) weighing 25 gm and 8cm uniformly and kept for drying. After drying they are kept in *sharava* (mud saucers) and *sandi bandhana* (sealing with rag and

mud) is to be done and 5 *varaha puta* are given a fine dark brown color *bhasma* is obtain. In this study for complete *bhasma lakshana* appears it took total 8 no of putas.^[3]

Subjecting sample to classical *bhasma* (ashes) *parikshas*

a) *Rekhapurnata*:

- A pinch of *Swarnamakshika bhasma* was rubbed in between thumb and index finger.
- It was observed whether *bhasma* enters the furrows of finger or not. *Bhasma* after 7th *puta* passed this test.

b) *Varitara*:

- Clean water was taken in a glass and allowed to stand. A pinch of *Swarnamakshika bhasma* was sprinkled on the surface of water. It was observed whether *bhasma* floats on the surface of the water or not. *Bhasma* after 7th *puta* passed this test.

c) *Unama*:

- This is continuation of the above test where in rice grain is placed on the surface of *bhasma*. It is observed whether the floating still persists or not. *Bhasma* after 7th passed this test.

d) *Nishchandrata*:

- A pinch of *bhasma* was taken and observed under bright sunlight. *Bhasma* after 7th *puta* there were no shining particles in the *bhasma*.

e) *Nirdhumatva*:

- A pinch of *bhasma* was sprinkled on the ignited charcoal and observed for any fumes emerging out of it. There was no emerging of fumes when *bhasma* after 7th *puta* was sprinkled.

Subjecting sample to NPST^[4]

To verify the quality of the prepared *Swarnamakshika Bhasma* and to standardize the *Swarnamakshika Bhasma* the sample was subjected to NPST. Initially, 0.25 grams of each sample was taken in two separate test tubes. Each test tube was heated till the bottom

appears red with the help of spirit lamp and they were allowed to self-cool. 0.5 ml of 5% HCl was taken in a graduated pipette and slowly dropped into the each test tube. Now again test tubes were heated for a while separately. The samples were allowed to stay for 24 hours.

Two hours before treating with a chemical reaction paper, the test tubes were shaken and then kept undisturbed. Then a drop of supernatant solution of each sample was dropped on the 2.55 Potassium Ferro cyanide paper with the help of dropper carefully. No sooner the drop came in contact with the 2.5% Potassium Ferro cyanide paper an instantaneous characteristic spot began to form and changes rapidly and continuously for some time.

Observation was made in following phases.

Ist phase - 0-5 min.

II Phase - 5 min-20 min

III Phase - 20 min-1 day.



Figure 1: I Phase



Figure 2: II Phase



Figure 3: III Phase

Table 2: Observation and result showing NPST results of Swarna Makshika Bhasma

SN	Sample	I Phase	II Phase	III Phase
1.	SMB	Dark brown colored central spot with regular margins Light brown periphery	Dark brown colored central spot White ring at periphery.	Fading of Central spot with light brown margin.

DISCUSSION AND CONCLUSION

The colors of the *Swarnamakshika bhasma* looks dark brown. It may be due to Marana (Incineration), and also on the number of *puta* given. As in classics mentioned 5 but it required 8 *puta*. The touch of the *bhasma* showed that very fine and smooth powder. A metallic taste was seen at the stage of 6th *puta* which may indicate improper formation of the *bhasma*. Keeping this mind we given still 2 more *putas* than *bhasma siddhi laxanas* is seen clearly on the 8th *puta*. Though samples passed the all the *bhasma pariksha*, like *Varitara* (Floats on water), *Rekhapurnatva* (farrows in the finger lines), *unnama* (loading with rice grain), *nischandra* (no shining particles), *nirdhuma* (no smoke) etc. showing that physico-chemically the *bhasma* was totally formed. If these tests show

negative means then it would have indicated the presence of a metallic part in the *bhasma* and it is impossible to do the NPST test. In NPST the desired accurate spots were seen in *Swarnamakshika Bhasma*. Advantage of conducting NPST over other classical *bhasma parikshas*. The classical tests cannot differentiate between adulterated *Bhasma* and pure *bhasmas* chemically, but in NPST, as the test is basically chemical reaction, with specific results for specific *bhasmas*, we can differentiate between adulterated and pure *bhasmas* clearly. This technique is very helpful for quality assessment of *Bhasma* as per the standards of *Rasashastra*. In other words, *bhasmas* can be identified by their name given in *Rasashastra* (Indian Alchemy) by virtue of their quality differences, but not chemically. It is such a simple test that it can be carried out with minimum set up and requirements. CCRAS has also accepted the monograph of NPST, and so the quality of *Bhasma* can be checked before being used therapeutically. *Swarnamakshika bhasma* which is prepared in our *Rasashastra* (Indian Alchemy) department gave results in accordance with the text.

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