

Research article

Pharmaceutical preparation and Standardization of *Kasis Bhasma*

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ABSTRACT:

Preparation of *Bhasma* includes various processing steps like *Shodhana*(purification), *Bhavana*(levigation), *Marana*(calcination) etc, processing of *Bhasma* aims at evaluate the properties of *Kasis Bhasma* which can act in minimal dosage, palatable, easy for assimilation, highly efficacious with minimal or no complication. A Pharmaceutical preparation was conducted using *Rasatarangini* reference. *Shodhan* of *Kasis* was done by *swedana* method and *marana* was carried with *Nimbu swarasa* and *Putra* method was used. Organoleptic as well as physico-chemical properties of *Kasis Bhasma* were noted. The prepared *Kasis Bhasma* was subjected to advance analytical test such as ICP-AES(Inductively coupled plasma atomic emission spectroscopy), XRD(X-ray Diffraction), FEG-SEM(Field Emission Gun Scanning Electron Microscopy) and *Ayurvedic* parameters eg. *Rekhaupnatva* (*Bhasma* should enters in between lines of finger), *Varitaratva* (*Bhasma* should float on the surface of water), *Uttam*(*Bhasma* should float on water and placed grain upon the *Bhasma* should float) and *Niramlatva* (bitter less). ICP-AES analysis shows the presence of new elements in *kasis bhasma*. Analytical study shows a significant difference between *Ashodhit kasis* and *Kasis Bhasma*.

KEY WORDS: *Ashodhit Kasis, Kasis Bhasma, Putra* method, analytical study.

INTRODUCTION:

Ayurveda is a healing science, provides knowledge and understanding of life based on the studies and keen observations of intellectual seers from India. *Rasashastra*, one of the branches of *Ayurveda*. Inclusion of *Rasashastra* in therapeutics which helps to treat the disease & further strengthened *Ayurveda*. In *Rasashastra*, the minerals are categorized as *Maharasa*, *Uparasa* and *Sadharanarasa* based on different criteria. *Kasis* is categorized under *Uparasa*. For proper usage of drug and to make it free from impurities, *Shodhan* (purification) process is essential. *Shodhan* not only purify the drug but also add therapeutic properties and make suitable it for further procedure such as *Marana*, *Bhasmikaran*. *Bhasmas* are unique *Ayurvedic* preparations of metals/minerals formulated with herbal extracts or juices and used for the treatment of a variety of ailments. Owing to their micro or nano fineness, ease of administration and comparatively small dose, they have been known for their vast area of application and therapeutic value. It is necessary to standardize such type of *Bhasma* on the basis of their classical tests as well as using the advanced analytical parameters like ICP-AES, XRD, FEG-SEM. The present study was conducted to perform physicochemical characterization for the *Kasis Bhasma* as per the procedure mentioned in the literature by using several analytical tools.

Aim of the study:

To evaluate the properties of *Kasis Bhasma*

Objectives of the study:

- Preparation of *Kasis Bhasma* according to *Rasatarangini* reference using *Putra* method
- Organoleptic, Physicochemical and advance analytical study of *Kasis Bhasma*

MATERIALS AND METHODS:

The intent of the study is preparation of *Kasis Bhasma*. *Kasis Bhasma* was prepared using *Rasatarangini* reference. For preparation of *Kasis Bhasma* following process were carried out:

A. Procurement and authentication

Raw materials were procured from authentic suppliers. Identification, selection and procurement was done with their accepted characters (*Grahya Lakshan*) specified in the authoritative texts of *Rasashastra*.

B. *Kasis Shodhan*^[1]

कासीसं भृंगराजोत्थवारिणा घटिकाब्दयम् ।

सकृत् स्विन्नं प्रयत्नेन शुद्धिं आयाति अनुत्तमम् ॥ र.त. 21/230

Shodhan of Kasis was done in *Bhrungaraja Swarasa* by *Swedana* for 3hours with the help of *Dolayantra*.

C. Preparation of Kasis Bhasma^[2]

काञ्जिकेन तु विभाव्य सप्तधा शोषयेत्खगमिनांशुभिर्बुधः।
सम्पुटेच्च लघुना पुटेन तत् स्याद्वि भस्म खलु लोहितप्रभम् ॥
समादायाथ तद्भस्म पेषयेन्निम्बूकद्रवैः । चक्रिकाः कारयित्वा च पुटेल्लघुपुटे पुनः ॥
यावन्निरम्लं तद्भस्म तावदेवं पुनः पुनः । निम्बूकोत्थे रसैर्वैद्यः पिष्ट्वा संशोष्य सम्पुटेत् ॥
सुशुष्कं जायते भस्म सर्वदोषविवर्जितम् । तत्साध्येषु विकारेषु वीतशकडः प्रयोजयेत् ॥

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Kasis bhasma was prepared by *marana* process in this

process, *Shodhit Kasis* was taken in *Khalvayantra* and triturated with *Kanji* for seven times. After the 7th *Bhavana* of *Kanji* uniform size, small pellets of *Kasis* was prepared. The pellets were sun dried and kept in *Sharavasamputa*. The *Sharavasamputa* was sealed with *Maatkapada* and *Sharavasamputa* was kept for sun drying. The dried *Sharavasamputa* was then placed in the *Laghuputa*. After completion of the 1st *Putra*, *Bhavana* of *Nimbu Swarasa* was given and subjected to *Laghuputa*. This process was repeated for next five times after that dark red colour of *Kasis Bhasma* was formed.

Figure No. 1 to 14: Photographs of Preparation Kasis Bhasma

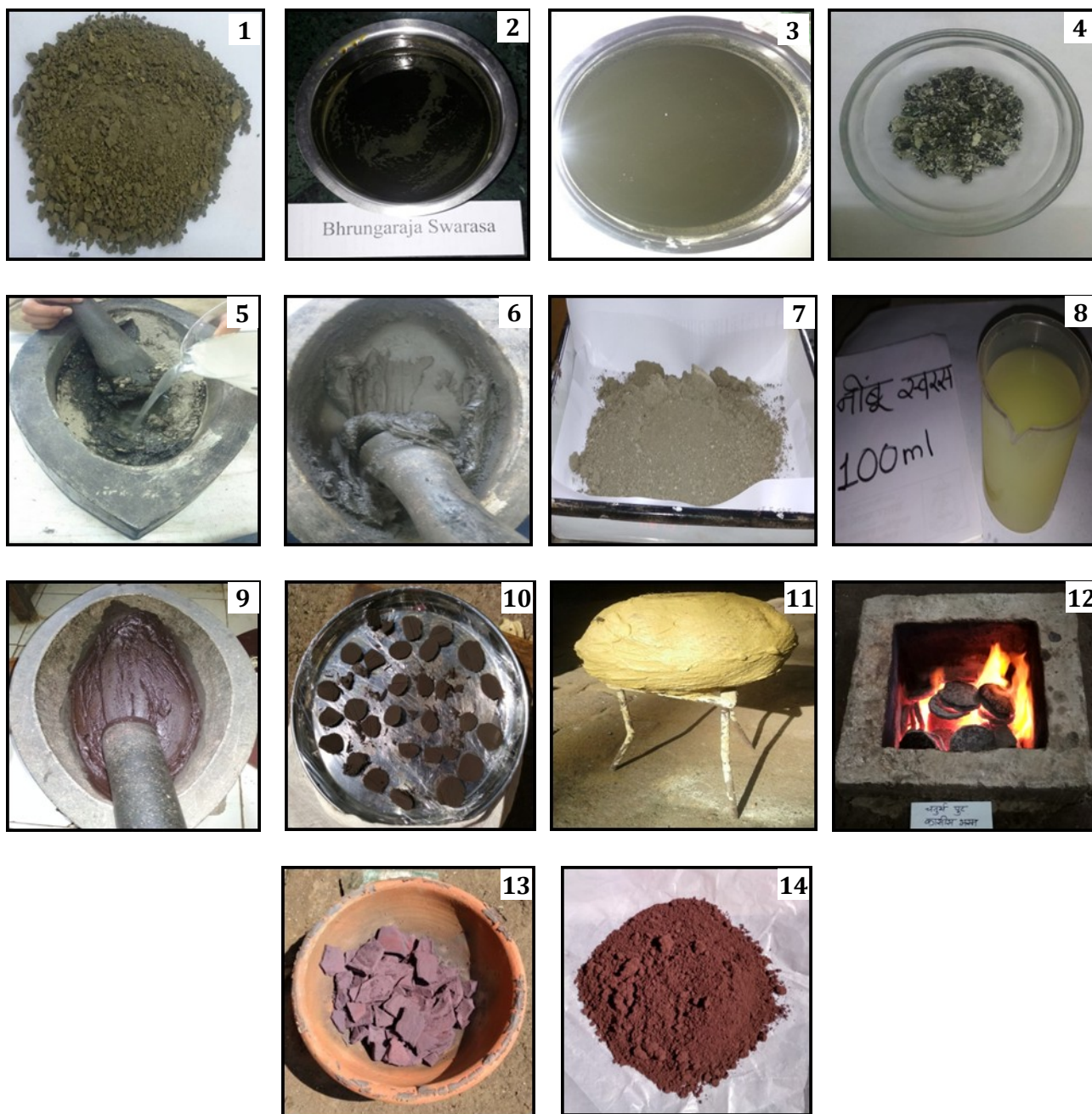


Figure No. 1: Ashodhit Kasis, 2: Bhrungaraja Swarasa, 3: Dissolved Kasis in Bhrungaraja Swarasa
4: Shuddha Kasis 5&6: Bhavana of Kanji to Shodhit Kasis 7: Kasis after seven Bhavana of Kanji
8: Fresh Nimbu Swarasa 9: Bhavana of Nimbu Swarasa 10: Chakrika 11: Sharavasamputa with Kapadmitti
12: Laghuputa 13 & 14: Kasis Bhasma

Analytical Test:

Ashodhit Kasis and Kasis Bhasma were analyzed by using organoleptic parameters, physico-chemical tests, Bhasma Pariksha and Inductively coupled

plasma atomic emission spectroscopy analysis(ICP-AES), X-ray diffraction analysis(XRD), Field emission gun-scanning electron microscopy analysis(FEG-SEM)

OBSERVATION AND RESULTS:**Table No. 1: Organoleptic parameters**

Parameters	Ashodhit Kasis	Kasis Bhasma
Appearance	Crystalline	Fine Powder
Colour	Greenish	Dark Red
Odour	Odourless	Odourless
Taste	Tasteless	Tasteless
Texture	Rough	Smooth

Table No. 2: Results of Pharmaceutical Study

Initial wt. of Ashodhit Kasis (gm)	Wt. of shodhit Kasis (gm)	Loss (gm)	Wt. of Kasis Bhasma (gm)	Loss (gm)
1000	656	344	178	478

Table No. 3: Temperature pattern observed in Puta at 15 minutes interval

Time (minutes)	Temperature (°C)
0	39
15	80
30	225
45	390
60	550
75	690
90	670
105	650
120	620
135	580
150	535
165	480
180	415
195	350
210	270
225	200
240	140
255	80

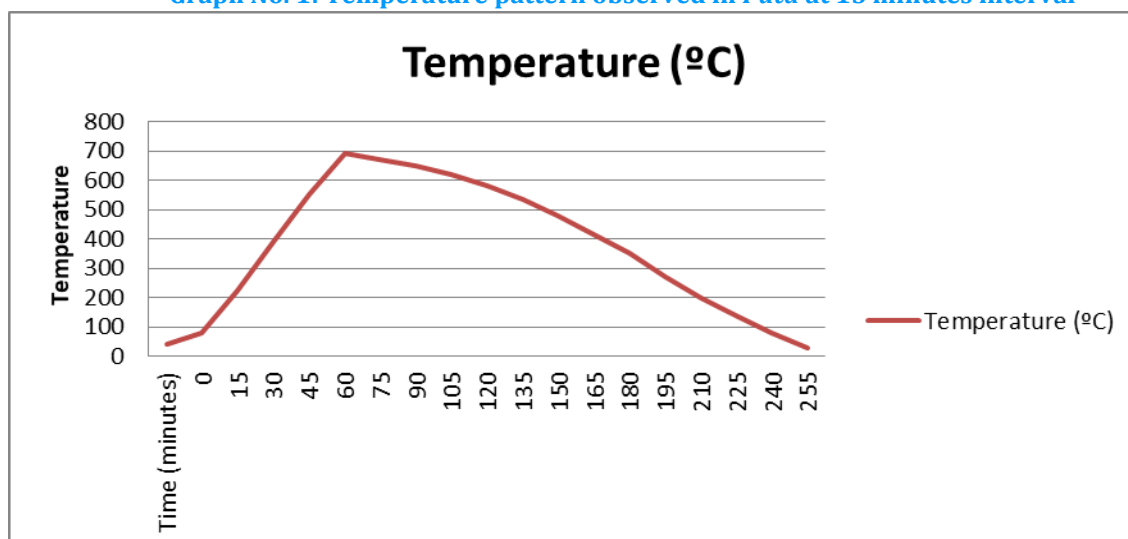
Graph No. 1: Temperature pattern observed in Puta at 15 minutes interval

Table No. 4: Physico-chemical tests

Name of tests	Ashodhit Kasis	Kasis Bhasma
Moisture content (LOD)	1.1 %	1.1 %
Total ash	33.33 %	93.24 %
Acid insoluble ash	2.40 %	66.85 %
Water soluble ash	34.54 %	90.06 %
Specific gravity	1.98	1.86
Elemental Assay	% Iron,	26.25 % Iron, 16.37 % Sulphur 45.25 % SO ₄
pH	-	8.2

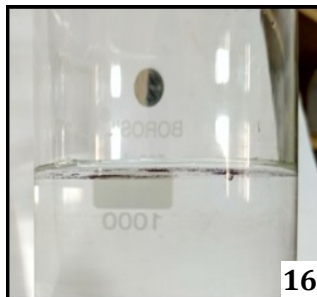
Table No. 5: Bhasma Pariksha

Sr. No.	Name of Bhasma Pariksha	Result
1.	Rekhpuranatwa	Positive
2.	Varitaratwa	Positive
4.	Uttama	Positive
5.	Niramlatwa	Positive

Figure No. 15 to 17 Bhasma Pariksha



Figure No. 15: Rekhpuranatwa,



16: Varitaratwa and Uttam,



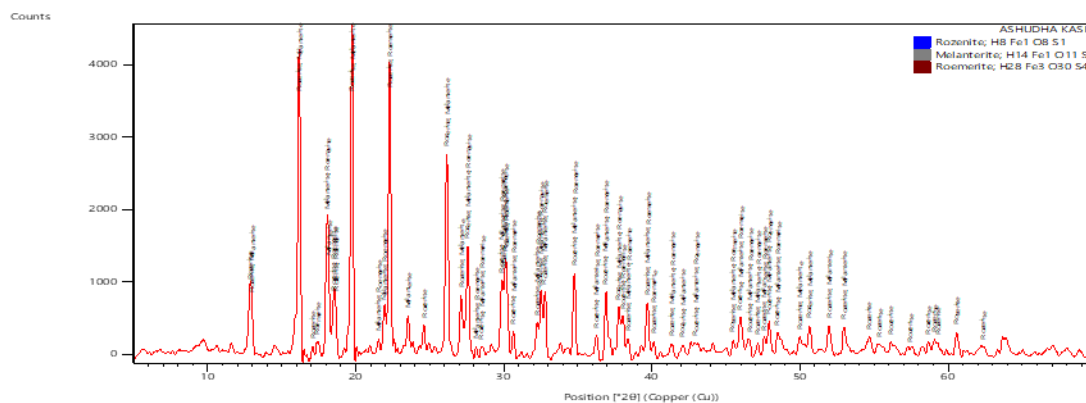
17: pH of Kasis Bhasma

Table No. 6: Inductively coupled plasma atomic emission spectroscopy (ICP-AES):

Elements in Ashodhit Kasis	Elements in Kasis Bhasma
Al, B, Ca, Co, Cr, Fe, Mg, Mn, Na, Ni, S, Sr, Yb, Zn Mo	Al, B, Ca, Co, Cr, Fe, Mg, Mn, Na, Ni, S, Sr, Yb, Zn Ba, Cd, Cl, Cu, K, Li, P, Si, Ti, V, Zr

X-ray Power Diffraction (XRD):

Graph No. 2: XRD of Ashodhit Kasis:



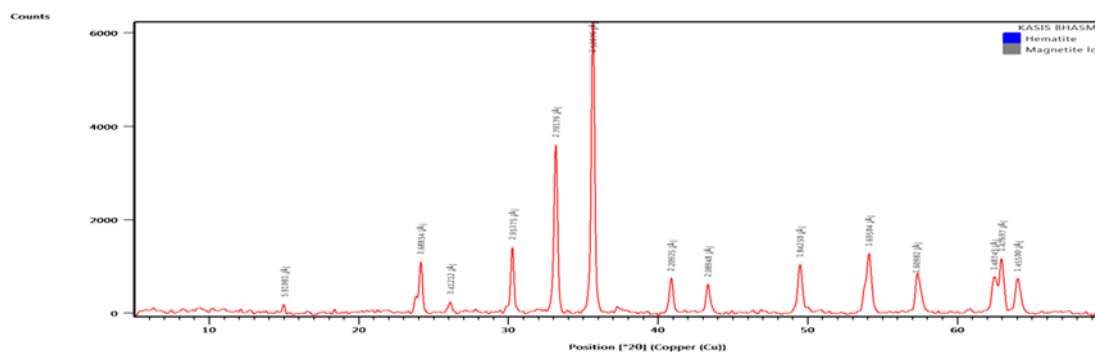
Graph No. 3: XRD of *Kasis Bhasma*:

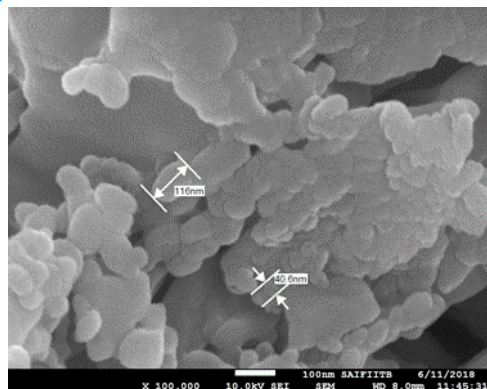
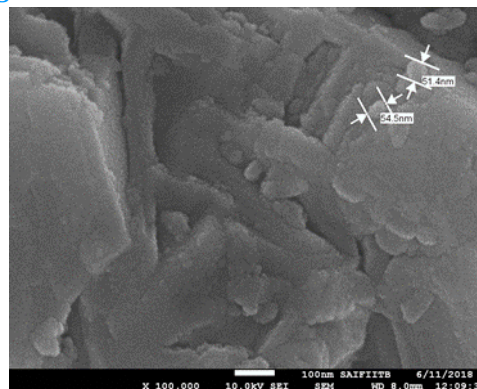
Table No. 7: Compound in XRD

XRD of Ashodhit Kasis	XRD of Kasis Bhasma
H14 Fe1 O11 S1 Rozenite	Fe2 O3 Hematite
H14 Fe1 O11 S1 Melanterite	Fe3 O4 Magnetite low
H28 Fe3 O30 S4 Roemerite	

Field Emission Gun Scanning Electron Microscopy (FEG SEM) :

The particle size of *Ashodhit Kasis* is 116nm.

The particle size of *Kasis Bhasma* ranges from 51.4 to 54.5 nm.

Figure No. 18: FEG-SEM scan of *Ashodhit Kasis*Figure No. 19 : FEG-SEM scan of *Kasis Bhasma*

DISCUSSION:

Kasis has *Raktasanjana* property and *Rogaghanata* as *Rajapravartak*, *Pandurognashak*, *Yakrutarogahara* etc. are mentioned in *Granthas*. *Shodhan* of *Kasis* was done in a *Dolayantra* using *Bhrungaraja Swarasa* by *Swedana* procedure for 3 hrs. While giving uniform heat, *Kasis* was dissolved in *Bhrungaraja Swarasa* due to which *Bhrungaraja Swarasa* got thicker consistency. *Shodhit Kasis* has the odour of *Bhrungaraja Swarasa*. *Shuddha Kasis* obtained was 68% with the loss of 32% in its weight. This loss was due to various physical adulterations which were remained undissolved in the *Pottali* during *Swedana* procedure.

While performing the *Bhavana* of *Kanji* to *Shodhit Kasis*, *Amla Gandha* was noticed. *Bhavana* procedure leads to the absorption of *Kanji*, resulting in increased weight of *Kasis* by 24% after completion of seven

Bhavanas. The colour of *Shodhit Kasis* was green with crystalline appearance and rough surfaces. On its exposure to heat, it turns pale green due to loss of water. After completion of six *Putas*, *Kasis Bhasma* changes its property to odourless and tasteless, which acquired *Niramlatwa*. *Bhasma Pariksha* such as, *Varitaratwa*, *Rekhaupuranatwa*, *Uttam* and *Niramlatwa* were performed, to assess the quality of *Kasis Bhasma*. After *Marana* procedure total 26.17% *Kasis Bhasma* was obtained with 73.83% of loss. The loss in the preparation of *Kasis Bhasma* was probably due to: Evaporation of water molecules due to heat process like *Putra*, Loss of sulphur and oxygen in the form of *SO₂* and *Bhavana Dravya* such as *Kanji*, *Nimbu Swarasa* are responsible for the increased weight of *Kasis*. After every *Putra* reduction in weight of *Kasis* was noticed.

The organoleptic characters and physico-chemical tests such as pH, Moisture content (LOD), Total ash, Acid insoluble ash, Water soluble ash, Specific gravity, Elemental assay was conducted to know the quality of Raw material and finished product. The colour of *Ashodhit Kasis* was dark green, crystalline and smooth in touch. On exposing the *Kasis* to heat, colour changes to dark red, fine powder, soft and smooth in touch. pH of *Kasis Bhasma* was tested by litmus paper which was 8.2.

ICP-AES (Inductively Coupled Plasma Atomic Emission Spectroscopy) of *Ashodhit Kasis* and *Kasis Bhasma* was conducted to detect the presence of several elements in both the samples. Al, B, Ca, Co, Cr, Fe, Mg, Mn, Na, Ni, S, Sr, Yb, Zn are the common elements found in both (*Ashodhit Kasis* and *Kasis Bhasma*) the sample. Ba, Cd, Cl, Cu, K, Li, P, Si, Ti, V, Zr are some new elements found in the *Kasis Bhasma* which may be due to purification by *Bhrungaraja Swarasa*, *Bhavana* by *Kanji*, *Marana* by *Nimbu Swarasa*. Cd, Cu elements were found in *Kasis Bhasma* which are also mentioned in API standards.

XRD analysis of *Ashodhit Kasis* and *Kasis Bhasma* showed the difference in the structure of both the compounds. Presence of Rozenite ($H_8Fe_1O_3S_1/Fe^{2+}SO_4.4(H_2O)$), Melanterite ($H_{14}Fe_1O_{11}S_1/FeSO_4.7H_2O$) & Roemerite ($H_{28}Fe_3O_{30}S_4/Fe_2+Fe^{3+}_2(SO_4)_4.14H_2O$) in *Ashodhit Kasis*. The X-ray power diffraction study of *Kasis Bhasma* was recorded & its spectra was compared with standard peak of JCPDS (Joint Committee on Powder Diffraction Standards) confirming the presence of Fe_2O_3 , Fe_3O_4 . Rozenite ($Fe^{2+}SO_4.4(H_2O)$), Melanterite ($FeSO_4.7H_2O$) and Roemerite ($Fe_2+Fe^{3+}_2(SO_4)_4.14H_2O$) loses water molecule on heating which resulting into $Fe^{2+}SO_4$ (Rozenite), $FeSO_4$ (Melanterite), $Fe_2+Fe^{3+}_2(SO_4)_4$ (Roemerite). On further processing, (*Bhavana* of *Kanji* and *Marana* by *Nimbu Swarasa*) *Kasis Bhasma* shows the presence of Hematite (Fe_2O_3) and Magnetite low (Fe_3O_4) due to oxidation and reduction.

FEG-SEM (Field Emission Gun Scanning Electron Microscopy) scans of *Ashodhit Kasis* and *Kasis Bhasma* were done to determine the particle size. A Particle is considered nanoparticle when the size

ranges from 0.1-100nm. Particle size of *Ashodhit Kasis* was 116nm. The particle size of *Kasis Bhasma* estimated from FEG- SEM scans was ranges from 51.4 to 54.5nm. This conversion of non-nano particle (*Ashodhit Kasis*) in nano particle (*Kasis Bhasma*) shows the significance of *Putra* procedure in *Bhasma* preparation.

CONCLUSION:

XRD study for *Ashodhit Kasis* showed presence of structure of Rozenite ($H_8Fe_1O_3S_1$), Melanterite ($H_{14}Fe_1O_{11}S_1$) & Roemerite ($H_{28}Fe_3O_{30}S_4$) and presence of structure of Hematite (Fe_2O_3) and Magnetite low (Fe_3O_4) in *Kasis Bhasma*. It indicates the difference in the structure of both the compounds. FEG-SEM scan reveals the particle size of *Ashodhit Kasis* was 116nm and particle size of *Kasis Bhasma* was in the range of 51.4 to 54.5nm (i.e. nano particle). This conversion of non-nano particle (*Ashodhit Kasis*) in nano particle (*Kasis Bhasma*) shows the significance of *Putra* procedure in *Bhasma* preparation. ICP-AES analysis reveals that the presence of Aluminium, Boron, Calcium, Cobalt, Chromium, Iron, Magnesium, Manganese, Sodium, Nickel, Sulfur, Strontium, Ytterbium and Zinc element in *Ashodhit Kasis* and *Kasis Bhasma*. Some new elements such as Barium, Cadmium, Chloride, Copper, Potassium, Lithium, Phosphorous, Silicon, Titanium, Vanadium and Zirconium were found in the *Kasis Bhasma* which may be due to *Bhasmikaran* process. In the results quality of *Kasis Bhasma* are well- documented.

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- [1] Rasatarangini, Pandit Kashinatha shastrina, Motilal Banarasidas publication, Delhi, (2000), Page no. 562
- [2] Rasatarangini, Pandit Kashinatha shastrina, Motilal Banarasidas publication, Delhi, (2000), Page no. 566

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