International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 2, Suppl 4, 2010

Research Article

IMPORTANCE OF MEDIA IN THE PHARMACEUTICAL PROCESSING'S OF METALS AND MINERALS - SCANNING ELECTRON MICROSCOPY STUDY AND ENERGY DISPERSIVE X-RAY ANALYSIS OF ABHRAKA (BIOTITE)

PANKAJ RAI, VIKAS M. GUPTA,RICHA PATHAK,LAXMI NARAYAN GUPT, NEERAJ KUMAR ANDR.S. SINGH

Department of Rasa Shastra, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi – 221005, India
Department of Chemical Engg. And Technology, Institute of Technology, Banaras Hindu University, Varanasi – 221005, India
Email: vaidyaraipankaj@rediffmail.com

Received: 27 Jun2010, Revised and Accepted: 28 July 2010

ABSTRACT

Shodhana is an important intermediately pharmaceutical process during conversion of metals and minerals into bhasma (ash). Different media are described for the shodhana process of abhraka (Biotite). Shodhana of abhraka was done in the specific mediums i.e. cow-milk, cow-urine, decoction of triphala and badari separately. To find out the significance of these media, scanning electron microscopy study and energy dispersive x-ray analysis of abhraka was carried out. Field emission scanning electron microscopy (FESEM) study reveals that the plate late structure of abhraka not only remains intact but also became more granular and appears to be microcrystalline along with reduction in particle size after shodhana process. Energy dispersive x-ray analysis (EDAX) reflects the compositional variations of elements.

Keywords: Shodhana, Bhasma, Media, FESEM, EDAX

INTRODUCTION

Abhraka (biotite) is a mineral that contain several elements such as Si, Fe, Al, Mg and K as main ingredient and frequently used as raw material for preparation of many ayurvedic formulations specially bhasma (ash). Shodhana is an essential intermediately pharmaceutical process used for purification of metals and minerals during their conversion into bhasma (ash). It is a process of detoxification by which physical and chemical blemishes and toxic materials are eliminated thus make the material suitable for further processing i.e. conversion into bhasma[1]. Various techniques along with different media are referred in ayurvedic texts[2,3,4] for the shodhana of abhraka. Among them nirvapa [5,] process (heating to red hot stage and immediately quenched in liquid medium) for seven times is most acceptable for shodhana of abhraka. Cow-milk, decoction of triphala {pieces of dry fruits Haritaki (Emblica officinalis), Vibhitaki (Terminalia bellirica) & Amalaki (Terminalia chebula)}, cow- urine and decoction of badari (zizyphus jujuba) are frequently used as medium [6,7,8]. Recent advances in analytical techniques such as spectroscopy, electron microscopy, crystallography etc. can provide useful information about structural as well as compositional change in the raw material during the different steps of ayurvedic drug formulation. These changes eventually correlated with medicinal value added in the raw material during various formulation steps. The objective of the present study is to evaluate and confirm the changes in the properties of abhraka (biotite) during shodhana process using electron microscopy and energy dispersive x-ray analysis.

MATERIALS AND METHOD

Pharmaceutical processing of Abhraka

Raw abhraka (Biotite) was procured from Ayurvedic Pharmacy of Banaras Hindu University, Varanasi and subjected to shodhana process according to traditional ayurvedic procedures [9]. Raw abhraka and liquid media were taken in a clean iron pan and steel vessel respectively. Iron pan was kept on charcoal burner and peak temperature of charcoal burner was maintained with the help of electric blower. Abhraka flakes were turned up and down with metal tongs to provide uniform heating. When the abhraka (biotite) flakes reached at the stage of red hot condition (approx. 825^{0}C), it was quickly quenched into the liquid media and then abhraka pieces were separated by filtering through iron sieve and collected in an iron pan. Triphala kwath, cow's milk, cow's urine (gomutra) and badari kwath were used as media for shodhana and the process is repeated for seven times in each media separately. Abhraka (biotite) samples obtained after shodhana process was collected in sterile glass for further studies.

Analytical techniques

The samples were analyzed using FESEM coupled with EDAX (model: Quanta – 200ESEM). Before analysis, the samples were converted into fine powder form by means of a glass mortar. A small amount of the sample was mounted to the stub with silver glue, prepared with silver powder and isopropyl alcohol.

RESULTS AND DISCUSSIONS

Results of FESEM studies are shown in Fig.1 to 5. Fig.1 shows the presence of layered structure along with granular particles within the layered structure. In Fig. 2 layered like structure is present but the granular particles have been decreased as compare Fig.1 (raw material).

In Fig.3 new granular particles are appeared on the surface of layered type structure. Fig.4 shows that maximum density and size of granular particle have been increased significantly. In Fig.5 the layered and granular structures are less. FESEM results revealed that the plate late structure of abhraka was remains intact even after shodhana process. However they became more granular and appeared to be microcrystalline. Particle size in the shodhit samples were decreased as compare to the raw material. Maximum reduction in the particle size was appeared in the sample treated with decoction of badari.

Energy dispersive X- ray analysis was used to analyze elemental composition of samples. The results are tabulated in Table 1 and 2. These tables show the weight (%) of major and minor element present in different samples.

Table 1: Weight (%) of major elements in different samples

Sample	C	O	Fe	Si	Al	Mg	K
1	7.23	42.94	13.27	18.4	9.01	6.06	3.8
2.	14.87	31.35	13.84	13.38	7.01	3.98	6.89
3.	21.95	35.10	12.34	12.16	6.62	4.23	5.65
4.	9.23	35.76	17.49	14.75	7.08	4.57	7.08
5.	14.72	36.18	14.76	13.04	6.73	4.01	6.78

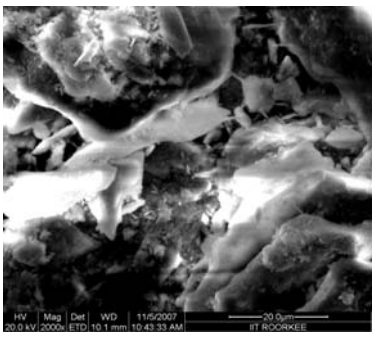

Fig. 1: Raw Abhraka

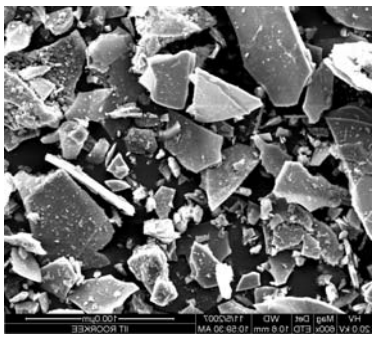

Fig. 2: Triphala kwath shodhit Abhraka

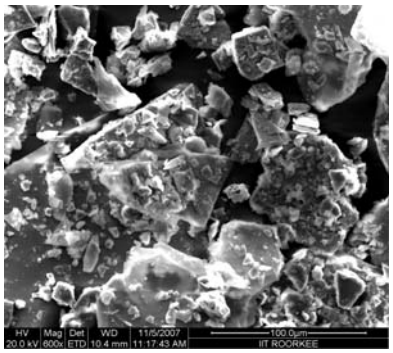

Fig. 3: Godugdha shodhit Abhraka

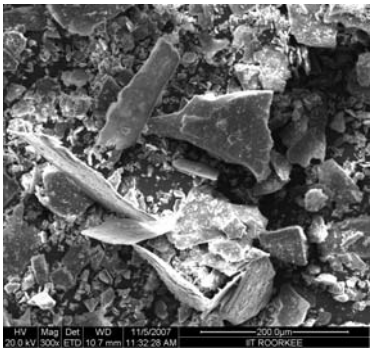

Fig. 4: Gomutra shodhit Abhraka

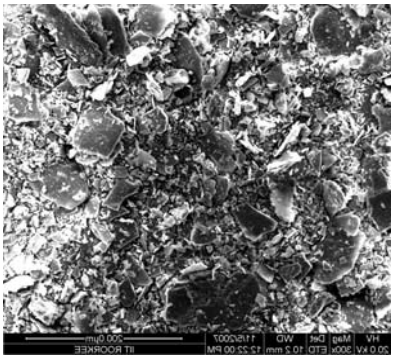

Fig. 5: Badari kwath shodhit Abharak.

Table 2: Weight (%) of minor elements in different samples

Element %	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
F	1.30	ND	ND	0.95	1.22
Cl	0.19	ND	ND	ND	ND
Pd	0.39	ND	ND	ND	ND
Ti	1.23	ND	1.38	1.76	1.46
P	ND	0.19	ND	ND	ND
Nb	ND	2.23	ND	ND	ND
Ru	ND	0.21	ND	ND	ND
Cs	ND	0.49	ND	ND	ND
Ba	ND	2.91	ND	ND	ND
V	ND	0.16	0.24	0.59	0.42
Pb	ND	2.48	ND	ND	ND
Co	ND	ND	ND	0.76	0.71
Na	ND	ND	0.33	ND	ND

ND- Not detected

Table1 and 2 show that the raw material (Sample – 1) contain Fe, Si, K, Mg, Al, K, C and O in the major quantity (major element) where as F, Cl, Pd and Ti were also found in the sample. It appears that raw material (biotite) contains Mg, K, Fe, Al and Silicate with carbon present in it from the natural organic matter. The weight (%) of several elements taken together indicates the presence of the predominant silicate group along with aluminum-silicate group with Fe and Mg as ionic species. Significant variation in the major and

minor elements composition was observed after shodhana process using different media. In major elements, % weight of Mg, Al and Si was decreased whereas Fe and K increased. Some additional minor elements were found added and some were eliminated after shodhana. Cl and Ti were detected only in raw sample. Maximum numbers of minor elements were added in the sample 2 in which triphala kwath was used as media. Source of new elements present in the shodhit samples may be elements presents in the media.

CONCLUSION

The present studies illustrate the significance of shodhana process in the preparation of abhraka (biotite) based ayurvedic formulations. Results also revealed the importance of media in the shodhana. Various physico-chemical changes were occurred depending upon the selection of the media during the shodhana such as reduction in particle size, variation in density and granular size, variation in elemental composition of major elements and addition as well as deletion of minor elements from the raw material.

REFERENCES

1. Shastri, K.N.: Sadanand Sharma's Rasa Tarangani, Motilal Banarasi Das, Varanasi, 22, 2002.
2. Mishra, S.N.: Somdeva's Rasendra Chudamani, Chaukambha Orientalia, Varanasi, 135, 2004.
3. Sharma, Gulraj. : Madhava's Ayurveda Prakash, Chaukambha Bharati Academy, Varanasi, 284, 1999.
4. Tripathi, I.D.: Gopalkrishna Bhata's Rasaedra Sar Sangraha, Chaukambha Orientalia, Varanasi, 4, 2003.
5. Kulkarani, D.A.: Rasa Vagbhata's Rasa Ratna Sammucchaya, Meharchand Lacchman Das, New Delhi, 21, 1992.
6. Joshi. Damodar., Pharmaceutical and Pharmacotherapeutics Studies on Abhrak Bhasma with special reference to Amlapitta, Department of Rasa Shastra, Institute of Medical Sciences, Banaras Hindu University, 98, 1973.
7. Jha. C.B., Standardization of Abhraka Satvapatana, Department of Rasa Shastra, Institute of Medical Sciences, Banaras Hindu University, 142, 1991.
8. Kadam. Ajit., A Comparative Study of Abhraka Satva Bhasma and Loha Bhasma, Department of Rasa Shastra, Institute of Medical Sciences, Banaras Hindu University,128, 1997.
9. Kulkarani, D.A.: Rasa Vagbhata's Rasa Ratna Sammucchaya, Meharchand Lacchman Das, New Delhi, 21, 1992.