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## An Attempt to Develop Mineralogical Characterization of Abhraka (Mica); An Ayurvedic Mineral Drug

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### ABSTRACT

The metals and minerals are the treasures of herbomineral formulations of Ayurvedic system of medicine. Abhraka (Mica) is mentioned as the first substance in the classification of Maharasa. It is widely used for treatment of a number of diseases. The present study deals with the mineralogical characterization of mineral Abhraka having medicinal importance in Ayurvedic system of medicine. Abhraka is used in the form of Bhasma for the treatment of Jwara (fever), Grahni (dysentery), Prameha (diabetes), Rakhtapitta (hemorrhage), Kshaya (tuberculosis), Mutrakrichra (urinary infections), Vatavyadi (arthritis), Pittaroga (acidity) and other diseases. However, raw drug standardization plays a vital role for assuring the therapeutic potential of the final drug. Abhraka is distributed throughout in Andhra Pradesh, Bihar, Jammu and Kashmir, Kerala, Madhya Pradesh, Orrisa and Rajasthan. The sample of Abhraka was collected from local vendor and authenticated by the subject expert and further analysed through physical properties of the mineral. The results showed that Abhraka is mineral of potassium, iron aluminium and silicate with black color, flaky crystals, massive to platy crystal and micaceous fracture. All these physical properties and study of Electron Probe Micro Analysis (EPMA) of mineral Abhraka are very well match with the acceptable characteristics of Abhraka (mica) as described in Ayurvedic classic.

### KEYWORDS

*Abhraka (Mica), Maharasa, Mineral, Rasasastra, EPMA.*



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## INTRODUCTION

Abhraka is mentioned as the first substance in the classification of Maharasa according to Rasaratna Samucchaya. Ayurvedic products are usually prepared of herbs and herbo-mineral combination<sup>1</sup>. The most important aspect of Ayurvedic formulation is their balance, integrity and synergy in relation to human body and to triple humors Vata-Pitta and Kapha<sup>2</sup>. The metals and minerals are the treasure of herbomineral formulations of Ayurvedic system of medicine<sup>3</sup>, Rasa Shastra is a branch of Ayurvedic pharmaceuticals, which deals with the pharmaceutical procedures (Shodhana, Jarana, Bhavana, Marana, etc) selectively, specify for the minerals and metals to convert them into a suitable medicine<sup>4</sup>. Among several mineral elements used in Ayurvedic products, mica in the form of Abhraka Bhasma is used since long time. In Sanskrit, mica is known as Abhraka and also known as powdered Talc, Biotite (black mica). Biotite mica enriched with iron rich ions are widely used as a major mineral ingredient in traditional

pharmaceutical science of Alchemy (Rasa Shastra). Abhraka is one of useful mineral available in four types viz. Pinaka, Naga, Manduka and Vajra. Each variety is classified into four types, Sweta, Rakta, Peeta and Krishna. The therapeutically accepted ideal variety is Krishnavajra. References regarding availability of Abhraka in mines are found. Rasaratna Samnuchaya. Acharya explains that the Abhraka which is mined is said to have good medicinal properties<sup>4,6</sup>. Further it is said as Abhraka available in northern mountains has more essences and best in medicinal properties and is included under Maharasa with its therapeutic efficacy in the form of Bhasma. Rasaratna Samucchaya elaborated its use as mineral in various industries as well as drug in Ayurvedic pharmaceuticals. Vagbhata, the author of Rasaratna Samucchaya elaborately explained its physical properties and categorized under the group of Maharasa<sup>7</sup> (one of the important group of minerals) Table-1.

**Table 1** Description of mineral Abhraka from an Ayurvedic perspective.

Category	Details
Broadly classified group	Maharasa (a category of mineral having more therapeutic value).
Types, heating effect and adverse effect	Four groups: Pinaka – produce chit chit sound on heating and if consumed causes kushta and constipation; Naga - on heating produce sound like hissing of snakes and causes kushta and bhagandara when consumed; Manduka – on heating the sheets get thrown out like jumping of frogs, causes death on consumption; Vajra – no sound is produced on heating, on consumption it destroys all the diseases.



Colors and important uses	Each varieties classified into four types: Sweta - useful in swetakarma in treatment of swetakusta; Rakta – used to raktakarma, has haematinic properties; Peeta - best for peetakarma, in the treatment of kamala; Krishna- excellent in all varieties, eradicating all sort of ailments.
Therapeutically accepted	Krishnavajra, the ideal one, unanimously accepted.
Grahya Lakshana	Krishnavajra, as the ideal one, is smooth, heavy, thick layered, good colored like Anjana and Vajra.
Shodhana	Kanji+Gomutra+Triphala kwatha+Godugdha - 7 times Nisheehana and trituration with Amaladravya for one day.
Putra	Acharyas prescribed the puta ranging from 1-1000. Gajaputa for preparation of Abhraka Bhasma.
Marana	Marana of Abhraka with several herbomineral (Gandhaka, Sarja Kshara, tankana) and animal (ajarkta, gomutra, naramutra) drugs.
Indications	Jwara (fever), Grahni(dysentery), Prameha(diabetes), Raktapitta (hemorrhage), Kshaya(tuberculosis), Mutrakrichra(urine infection), Vatavyada (arthritis), Pittaroga(acidity), Vranadosa(wound) etc.
Accessory medicine	Rassindura, Triphala churna, Trikatuchurna, Haritiki, Pippalichurna, Swarnabhasma, Bhumiamalki, Shunti, Chaturjatachurna, Kajjali.
Doses	125 mg to 375 mg (1 to 3 ratti)

It is used in the form of Bhasma for the treatment of Jwara (fever), Grahni (dysentery), Prameha (diabetes), Raktapitta (hemorrhage) Kshaya (tuberculosis), Mutrakrichra (urinary infections), Vatavyadi (arthritis), Pittaroga (acidity) and Vrana dosa (wound) etc<sup>8</sup>.

The Ayurvedic formulations are dependent on raw materials so that the required active drugs should be prepared. It is therefore important to select genuine raw substances and identify them so that further pharmaceutical procedures should be performed. Collection of authentic sample influences the quality of the final product, which is directly related to the therapeutic potential of a drug. The present study was thus undertaken to assess the characterization of Abhraka for its

mineralogical characterization through Ayurvedic as well as modern methods.

## MATERIALS AND METHODS

### Test sample

The samples of Abhraka were collected from the local market of Varanasi, Uttar Pradesh and authenticated by the subject expert. The minerals was then tested for its physical properties and mineralogical characterization was made for acceptability of genuine sample by adopting different methods.

### METHODS

The following three methods has been adopted for its characterization

a) Identification and physical verification of Abhraka according to Grahya- Lakshana



(acceptable properties) mentioned in the Ayurvedic classic texts.

**b)** Analysis of the physical properties of Abhraka as per the mineralogical description mentioned in the Ayurvedic Pharmacopoeia of India and

**c)** The mineral chemistry of various phases in the studied sample was carried out by Electron Probe Micro Analysis (EPMA) at

the Department of Geology, Banaras Hindu University, Varanasi.

## RESULTS AND DISCUSSION

The procured sample of Abhraka was identified and verified as per the classic reference<sup>9</sup>. Observation are shown in Table-2

**Table 2** Grahya Lakshana (acceptable properties) of Abhraka as per Ayurvedic classics

Acceptable property	Physical property	Observations
Anjanabham	Color	+
Mahojjalam	Lusture	+
Srigdham	Structure	+
Prthudalam	Cleavage	+
Guru	Heavy	+
Naibachinam, Vahanouna Saboeam Vanhou Kriptamma, Vikriti Properties- Samudbhuta	Reaction On fire	+
Uttaraseilottha	Utpatti	+

### Physical properties

The physical characterization was carried out as per the Ayurvedic Pharmacopoeia of India<sup>10</sup>. The results of mineralogical details

of Abhraka were verified as per the mineralogical description of mica<sup>11,12,13</sup> as shown in Table-3 and Fig. 1.

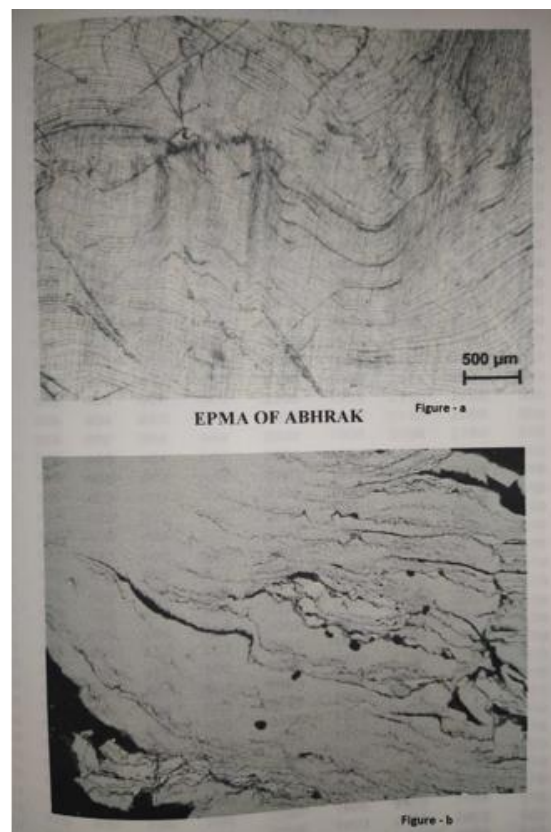
**Table 3** The results of physical properties of Abhraka (Mica)

SI No.	Characterisation Parameters	Abhraka (mica) Observations
1.	Nature of the crystal	Massive to platy
2.	Crystal structure	Monoclinic
3.	Crystal form	Flaky
4.	Color	Dark black
5.	Streak	Black
6.	Hardness	2.5 - 3.0
7.	Fracture	Micaceous
8.	Cleavage	Perfect cleavage
9.	Transparency	Transparent to Opaque
10.	Magnetism	Negative
11.	Acid test or fix test	Negative
12.	Flame color	White
13.	Roasting	Emitted white fumes
14.	Luster	Vitreous to perly
15.	Conductivity	Poor
16.	Specific gravity	2.8 - 3.4
17.	Heating in open tube	Light orange fumes turned into green on cooling
18.	Heating in close tube	Black color fumes and powder settled down at the bottom.



**Figure 1** Test conducted for physical properties verification of Abhraka (mica)

The Electron Probe Micro Analysis (EPMA) for the mineral chemistry and elemental assay of various phases of the studied sample was carried out and the results are presented in Table -4, Fig 2.



**Figure 2 (a and b):** Back scattered electron microscopy of mineral Abhraka by Electron Probe Micro Analysis (EPMA)

**Table – 4.** The elemental assay of mineral Abhraka analysed by EPMA.

Element S. No.	F	Na	Mg	Al	Si	Ti	Cr	Mn	Fe	Cl	K
1	0.81	0.09	4.15	7.16	16.53	1.51	0.05	0.18	18.77	0.20	6.85
2	0.89	0.13	4.17	7.81	16.30	1.92	0.07	0.30	18.12	0.17	6.82
3	0.45	0.06	4.37	7.45	16.60	1.90	-0.00	0.11	18.17	0.19	6.77
4	0.34	0.04	4.41	7.26	16.25	1.84	0.01	0.22	18.92	0.21	6.67
5	0.48	0.07	4.43	7.48	16.48	1.76	0.05	0.25	18.04	0.21	6.86
6	0.48	0.07	4.26	7.47	16.16	1.96	-0.04	0.17	19.02	0.22	8.89
7	0.66	0.07	4.31	7.28	16.56	1.86	0.04	0.22	18.39	0.17	8.87
8	0.41	0.05	4.36	7.44	16.47	1.77	-0.02	0.30	18.38	0.21	6.60
9	0.55	0.09	4.23	7.13	16.03	1.80	0.01	0.27	18.69	0.24	6.56
10	0.27	0.04	4.23	7.37	16.59	1.68	-0.01	0.16	17.51	0.22	6.71

## DISCUSSION

The present study deals with mineralogical characterization of mineral Abhraka according to Grahya Lakshana as explained in Ayurvedic classics as well as the mineralogical standards as mentioned in the

Ayurvedic Pharmacopoeia of India. India produces more than 50% of the total quantity of mica of the World. Abhraka (mica) of different varieties are found in Nellore and Visakhapatnam district of Andhra Pradesh, Kodarama and Hazaribag



in Bihar, Patri of Jammu and Kashmir, Malabar of Kerala, Balghat of Madhya Pradesh, Keonihar and Sundargarh of Orissa, Ajmer and Mewar of Rajasthan<sup>14</sup>. Chemical composition and physical properties vary from place to place and mine to mine. Some varieties may contain iron, magnesium, potassium, aluminum, silicon, lithium, fluorine, barium and also some metallic impurities.

Abhraka is categorized under Maharasa group by Acharya Vagbhatta It is available into four types viz Pinaka, Naga, Manduka and Vajra. Each variety is further classified into four types Sweta, Rakta, Peeta and Krishna. The therapeutically accepted ideal variety is Krishnavajra. This is black in color. Due to its color and hardness, it is termed Krishnavajra.

The physical properties for identifying the minerals are color luster, streak, hardness, cleavage, crystal structure, crystal form, fracture and transparency. Some other properties such as reaction with acid magnetism, specific gravity, conductivity roasting, reaction on fire and flame color are helpful in identifying certain minerals. Most of the physical properties verified in this study are very well match with the standard of mica [Table – 3 and Figure - 1]. The properties mentioned in classical text such as Anjanabham, Mahojjalam, Sringdham, Guru, Prthudalam,

Naivachinam, Vahanouna, Sabolam, Vanhou Krisptamna, Vikriti properties - Samudbhuta and Uttaraseilottha (Table-2) are very well matched with crystal habit, luster, nature etc, the physical properties of mineralogy. However, collection of sample from different geological sources may affect the physical properties of any samples. Luster describes the appearance of a mineral when the light is reflected from its surface. Abhraka, when heated in open tube gives light orange fumes and in close tube, gives black colored fumes and on roasting gives white fumes. The chemical formula of, Biotite Mica is given below



It is thus silicate mineral and composed of varying amounts of K, Mg, Fe, Al, F and H<sub>2</sub>O and having thin sheet like structure. It forms flat six-sided monoclinic crystals.

The Electron Probe Micro Analysis (EPMA) study confirmed that K, Mg, Fe, Al, Si and F are present in requisite amount as per structure of Abhraka. The elements Na, Cr, Mn and Cl are represented in trace amounts. Ti is present as major impurity (Table-4). The Figure - 2 (a and b) represented the back scattered electron microscopy of minor at Abhraka by EPMA. In industries, mica is used in gypsum wallboard, as pigment extender, thermal insulation, in electronic equipment, toothpaste, cosmetics, filters, soil



conditioners and prevents cracking<sup>15</sup>. It is also used in building materials, fire industries, welding, plastic, paper, rubber and other chemical industries. Abhraka Bhasma (mica ash) a pharmaceutical product containing treated mica is utilized in Ayurvedic treatments for different ailments.

The present study confirms the authenticity of Abhraka by following the standards of classical as well as contemporary references. However, therapeutically Abhraka is used after proper Shodhana<sup>16</sup>, Puta<sup>17</sup> and Marana<sup>18</sup> with proper combination of other drugs, dosage and selection of suitable vehicles. In Ayurveda, Abhraka and other metals or minerals are used in the form of Bhasma. In current trend, these Bhasmas are considered as nanomedicine due to most of the particles in nano range and biomedical application of nano medicine is well understood and is one of the emerging trend in medicine<sup>19</sup>.

## CONCLUSION

Ayurveda has mentioned acceptable properties of every metals and minerals. However, it is necessary to validate and establish those properties on the basis of contemporary knowledge for the selection of genuine sample, because raw drug standardization plays an important role in

assessing final drug for better therapeutic effects. The Ayurvedic Pharmacopoeia of India has mentioned 21 monographs of single metals and minerals. However, Abhraka (mica) is not included in that list. Hence, this study may be helpful to some extent to develop its standard monograph.

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