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VALIDATION OF THE TERM *NIRVAPA* VIS-À-VIS QUENCHING W.R.T. *ABHRAKA SHODHANA*.

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ABSTRACT

Shodhana Samskara (Purification Process) is an exclusive concept mentioned in *Rasashastra* a branch of pharmaceutical science of *Ayurveda*. It can be described as a process of purification done on various organic & inorganic drugs before using them in drug manufacturing. In this article with reference to *Shodhana* of *Krishnabhraka* (Black Mica) which is done by the process of *Nirvapa* i.e. quenching an attempt has been made to correlate the process of *Abhraka Shodhana* with Quenching. We put *Nirvapa* vis-à-vis quenching & explain each step & change during this process with basics of chemistry and Kinetic Theory Of Matter.

Keywords: *Nirvapa*, Quenching, *Shodhana*, *Abhraka*.

INTRODUCTION

Purification process (*Shodhana Samskara)* of metals and minerals is an exclusive process in Ayurvedic Doctrine. But unfortunately it is very difficult to explain this ideology to allied sciences in relative terminologies. *Samskara*[1] is a broad spectrum term which includes various small procedures like *Bharjana,Mardana,Bhavna* which are correlated to terms for modern pharmaceutics like Drying, Trituration, Levigation respectively. This correlation is accepted on procedural similarities but process like *Nirvapa* (Quenching) needs for elaborate discussion to prove that it leads to physical as well as chemical changes in a substance. While explaining the utility of these terms we have made an attempt to correlate step wise chemical changes occurring in the substance with the help of kinetic theory of matter during the *Nirvapa* with reference to *Abhraka Shodhana*.

Aims & objectives:

- To validate necessity of *Shodhana Samskara* in *Abhraka Shodhana.*
- To establish & validate the term *Nirvapa* vis-a vis Quenching.
- To explain the Quenching w.r.t. Kinetic theory of matter.
- To explain post Quenching changes w.r.t. Kinetic theory of matter.

Necessity of Shodhana in Abhraka Shodhana: Discarding impurities from raw drug by various processes like Levigation (*Bhavana*), foementation(*Svedana)* etc. is

known as *Shodhna*[2].It has been clearly mentioned in texts that before using *Abhraka* for any purpose, i.e. *Dhanyabhrakarna / Marana / Satvapatana*, one must purify it by described method to avoid the ill effects of *Patrabhraka* which are equivalent to a poison.[3] According to this reference, for *Satvapatana* and for internal administration, purified *Abhraka* must be used otherwise it may cause undesired effects[4].

In short, *Sodhana* acts as

- Purifier for physical, chemical and natural impurities
- Enhancer of properties
- Pre procedure of next *Samskara*

❖ ***Nirvapa:***

When a solid metal or mineral is heated till red hot stage and immediately plunged in to prescribed liquid media like water or milk etc the process is named as *Nirvapa*[5] (Quenching).

In *Rasa Ratna samucchaya ,Abhraka Shodhana*[6] is prescribed by *Nirvapa* for 7 times in *Triphala Kwatha* (Decoction) or *Kanji* (Gruel) or *Gomutra* (Cow's urine) or *Godugdh*a (Cow's milk) .

In this process, *Samsakara* occurs at 3 stages:

(1) Phase of Heating

(2) Phase of Quenching

(3) Post Quenching interaction between solid hot material and liquid media

The purification process can be explained on the grounds of these 3 steps - but for that we should know - the chemical formula of *Abhraka*.

Biotite - $(H, K)_2 (Mg, Fe)_2 (Al,Fe)_2 (SiO_4)_2$

Muscovite - $H_2K Al_3 (SiO_4)_3$

Phlogopite - $[HK (MgF)]_3 Mg_3 Al (SiO_4)_3$

Lepidolite - $kLi [Al (OHF)_2] Al (SiO_4)_3$

No.	Element	Category	Group	Period
1.	27 Al 13	Poor metal	III	3
2.	56 Fe 26	Transition metal	III	4
3.	24 Mg 12	Reactive metal	II	3
4.	28 Si 14	Metalloid	IV	3
5.	16 O 08	Non metal	VI	2
6.	39 K 19	Reactive metal	I	4

7.	01 H 01	Simplest element	I	1

Table-1.1 Contents of *Krishnabhraka* Vis-A-Vis Biotite[7]

So, Biotite is a complex of reactive, poor, transition, metals as well as metalloids and non metals. But according to chemistry the metallic ions are always held together by metallic bonds while non-metallic ions are held together by strong covalent bends formed by sharing of electrons. (Table 1.1)

So, Biotite is made up of covalent bonds between non-metallic ions and metallic bonds metallic ions. But these ions of metals and non-metals are combined together to form a molecule with the help of ionic bonds formed by electrostatic forces between anions and cations. Ionic compounds form lattices consisting of cations and anions. In an ionic lattice, the nearest neighbors of an ion are always of the opposite charge.

Ionic crystals are hard but much more brittle than metallic crystals. In a metallic crystal, the ions are identical and held together by mobile electrons. This remains true if one layer is slid against the next. However pushing one layer against another in an ionic crystal brings ions of the same charge next to each other. The repulsion force layers them apart.[8] Thus, during *Nirvapa* we need to break - these 3 types of bonds - as said previously.

Crystalline structure of Mica[9]:

A crystal of a mineral is the regular form which is assumed as result of the attraction between the atoms of which it is built, being exerted in fixed directions when it is in process of formation.

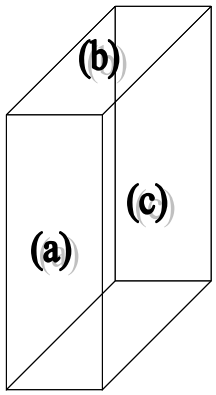

Fig. 1.1

Mica crystal shows monoclinic system of crystals (Fig. 1.1) and it shows the simplest form of pyroxene. One can see that the angles on its front face are an all right angle which indicates that two of its axes are at right angles to each other. If you were to hold such a crystal with it face (a) vertical, face (b) will also be vertical but the face (c) would be inclined so that the edge between (c) and (b) would not be horizontals.

This is one of the characteristic in which there are three unequal axes, two of which are at right angles while the third one is inclined to the vertical.

The monoclinic is one of the largest systems and includes Borax, Muscovite, and Phlogopite etc.

How minerals break – cleavage[10]:

Cleavage: It is the tendency of certain crystals to break in definite direction. The break is always parallel with the faces of one of the simple forms of the crystal system to which the crystals belongs.

It is natural to wonder why the cleavage is parallel with simple forms. X-ray studies have shown that the atoms, of which the crystal is built, are crowded densely in these simple planes and so that between them there is relatively more space, thus creating planes of weakness.

(a) The crowding of the atoms
(b) Internal structure of their crystals,

Are the main factors which decide the direction of the cleavage? So it is probable that there is a difference in the electrical attractions between the layers of the atoms which has an influence in determining the direction of cleavage. In Mica, the cleavage is so remarkably developed in one direction that, plates thinner than tissue paper, can readily be separated. This is the most remarkable characteristic of the great group of Micas. Such cleavage in whatever mineral it occurs is spoken as "Micaceous". This cleavage is always parallel with the base of the crystal and is consequently also called **Basal**.

Exploring the term …..Quenching w.r.t. Grain size[11]:

Minerals have a crystalline structure. Their crystalline areas are called as Grains. The boundaries between them are the Grain Boundaries.[14]In general the smaller the grain size the stronger and harder the metal.

Controlling the formation and re-formation of the grains in minerals can be achieved by heating and recooling it. If hot minerals at high temperature can be allowed to cool slowly, producing a large grain size called as **Annealing** and it makes minerals softer and easier to shape.

But when the metal is heated strongly and then cooled rapidly by plunging it into water the process is known as **Quenching**. Here the grain size is very small and minerals do not remain flexible / resilient, but become strong and brittle. Thereafter, the hardness of the minerals can also be controlled by **'working'** it, i.e. by beating or rolling it.(*Dhanyabhrakarana*)

Thus the strength and hardness of minerals can be controlled in these ways to suit the purpose for which it is used.

Probable mode of action of *Nirvapa*: One can hypothetically explain the mode of action of Nirvapa on the basis of Kinetic Theory of Matter[12] -

(1) Phase of Heating:

- Solid crystal at a rest has packed particles which are closed together in a lattice form and vibrate in their fixed position
- But when temperature increases the particle, gain energy and vibrate more strongly and occupy more spaces. This causes the solid to expand.
- At the same time, water molecules evaporate and come out through mineral separating *Abhraka* in various layers along its parallel cleavage planes.
- Increase in intra atomic distance leads to weakening of electrostatic forces.
- (v) Due to continuous heating, particles get enough energy to break forces holding them together and they can move around.

(2) Phase of Quenching:

Water media immediately penetrates inside and water soluble impurities get dissolved in it due to breaking of remaining ionic bonds. While sudden change in temperature causes breaking of other strong bonds too and this destroys its flexibility and makes it more brittle.

(3) Post quenching interaction between liquid media and minerals during instant cooling:

Due to heating the particles which are in random position when come in contact with liquid media, each molecule of the minerals get surrounded by liquid and the

self cooling takes place forming grain containing liquid media.

This may be the reason of imposing of properties of *Bhavana* or *Nirvapa Dravya* on minerals.

If this process of quenching is done for 7 times, naturally it is going to -

- Reduce hardness
- Impose the properties of various media
- Cause the color change

Observations:

1. In *Nirvapa, samskara* occurs at 3 said phases.
2. Ionic bonds are main cause of lattice structure and Basal cleavage of Mica.
3. *Abhraka* (Mica) is a complex of metallic, non-metallic constituents. These constituents are held together by metallic- ionic –covalent bonds which make them hard *(kathorangam)* and brittle **(***Sukha Nirmochya Patram***).**
4. Chemical Properties of matter changes w.r.t. grain size & process done for their formation and reformation.
5. Post quenching shelling of liquid media molecules also influences properties of materials.

DISCUSSION:

Now each and every drug in Rasashastra is correlated to its counterpart in metallurgical sciences with its basic components and their respective properties in periodic table. With same regards keeping in *Abhraka* (Mica) in mind we tried to explain how process of *Nirvapa* (quenching) actually works on a mineral while changing its physical as well as chemical properties completely. From the analysis it has been made clear that Mica is a combination of poor metal, transition metal, Non metal, reactive metal, metalloids to form a Ionic compound. These Ionic compounds form lattices with ionic bonds between cations and anions. Along with this a typical Monoclinic system of Mica crystal gives easy separation of Mica sheets parallel quoted as basal cleavage due to which it can show the property called *Sukha Nirmochya Patram* **.** But at the same time it is very difficult to break the mineral with hammer as its thick, dense and compact layer wise nature nullifies this pressure in angular direction so it is described to have *kathorangam (Hardness*).

In the process of *Nirvapa* (quenching), in initial heating phase particles of substance absorbs the heat energy. Second phase of quenching explains how instant cooling affect the strong nature of Mica. But the most important i.e. change in properties (*Gunantaradhana)* occurs in the last post quenching phase where reformation of grains take place including molecules of liquid media. So at the end of the process a product is constituted by combination of molecules of solid and liquid substances. Due to this reason the final product shows different properties than the original substance (*Gunantaradhana).*

CONCLUSION

1. The term *Nirvapa* in *Ayurvedic* texts can be validated as quenching according to advanced chemistry by applying Kinetic Theory of Matter.
2. The process of quenching & relative changes in the structure as well as properties can be explained along with Kinetic Theory of Matter**.**
3. Due to shell formation selection of liquid material does play an important role in the property changes of metal or mineral.

REFERENCES

1. Acharya Charaka .Charaka Samhita. Edited by vaidyas J T Acharya, Comm. By chakrapani,Chaukhamba SurBharti prakashana,Reprinted 2008. vimanasthana 1/22.2, Page No.235
2. Rasa Tarangini : Sadananda Sharma, Edited by Pt. Kashinath Shastry, 11th Edition 1989, Motilal Banarasidas, Varanasi.10/17, Page No.224
3. Rasa Ratna Samucchaya: Vagbhattacarya, Comm. by Ambika Dutta Shastry, 8th Edition 1988, Chaukhamba Sanskrit Samsthana, Varanasi.2/14. Page No.21
4. Rasa Ratna Samucchaya: Vagbhattacarya, Comm. by Ambika Dutta Shastry, 8th Edition 1988, Chaukhamba Sanskrit Samsthana, Varanasi.2/15. Page No.21
5. Rasa Ratna Samucchaya: Vagbhattacarya, Comm. by Ambika Dutta Shastry, 8th Edition 1988, Chaukhamba Sanskrit Samsthana, Varanasi.8/56. Page No.154.
6. Rasa Ratna Samucchaya: Vagbhattacarya, Comm. by Ambika Dutta Shastry, 8th Edition 1988, Chaukhamba Sanskrit Samsthana, Varanasi.2/16. Page No.21
7. Chemistry by Ricard Harwood; Cambridge University Press ,Reprinted 2002, Cambridge, U.K.,Chapter 3.1 Page No.64
8. Chemistry by Ricard Harwood; Cambridge University Press, Reprinted 2002, Cambridge, U.K.,Chapter 3.10, Page No.75.
9. 'Getting Acquianted with Minerals' by George Letchworth English, 1934, McGraw Hill Book Co. Inc. New York and London.
10. 'Getting Acquianted with Minerals' by George Letchworth English, 1934, McGraw Hill Book Co. Inc. New York and London.
11. Chemistry by Ricard Harwood; Cambridge University Press ,Reprinted 2002, Cambridge, U.K.,Chapter 3.16 Page No.90
12. Chemistry by Ricard Harwood; Cambridge University Press ,Reprinted 2002, Cambridge, U.K.,Chapter 2.10 Page No.46-47

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