

**KINETIC CHEMISTRY OF SATVAPATANA**Nischitha^{1*}, Deepa²¹Assistant Professor, Dept. of Rasa Shastra, JSSMAC, Mysore²Associate professor, Department of Kayachikitsa, JSSAMC, Mysore**ABSTRACT**

The history of *Satvapatana* can be traced out only in Rasa Tantra texts. *Satvapatana* is defined as Satva – being, existence, entity, reality, active principle or basic principle. Every substance in the universe is a Medicine, use of these substances for treatment is from various points of view, and it may be either for *Vyadhin ana* or *Rasayana*. But these substances are not used as it is, for these purposes, various types of *Samskara* performs on it to achieve the desired form of these substances. The aim of *Satvapatana* is to obtain the active principle of that ore that is free from all blemishes, To minimize dose without lowering its efficacy and to involve it in further procedures like calcinations etc.

KEYWORDS: *Rasayana, Samskara Satvapatana.***INTRODUCTION**

Every substance in the universe is a Medicine, use of these substances for treatment is from various points of view, and it may be either for *Vyadhin ana* or *Ras yana*. But these substances are not used as it is, for these purposes, various types of *Sansk ras* performs on it to achieve the desired form of these substances. One of such *Sansk ras* is *Satvap tana*. *Satvap tana* is a process which can be defined as extraction of essence from its original form.

HISTORY

- ▣ The history of *Satvap tana* can be traced out only in Rasatantra texts.
- ▣ But references about metallic jewellerys or weapons (Hiran)ya, Ayasa etc.) are found in Rgveda, Atharvaveda, from which it can be indirectly stated that our ancestors were well known about the process of *Satvap tana*.
- ▣ Some indirect references are available in scattered texts of Ayurveda. In Brhatrayi also, there is no direct reference regarding process of *Satvap tana*. Nagarjuna was the first who mentioned the process of *Satvap tana*.
- ▣ In Rasendramangal, eight procedures of *Satvap tana* are available for different minerals.
- ▣ In Anand-kanda, 36 methods of *Satvap tana* are given for 13 minerals. Various references are found in RHT, which the author utilized these Satvas in

PARADAKARMA. In Rasarnava, description of *Satvap tanais* found for 9 substances, 19 methods of *Satvap tana* are found in Rasa Ratnakara text for 13 minerals.

What is *Satvap tana*?

- Satva – being, existence, entity, reality, active principle or basic principle.
- Patana – causing to fall, separation or extraction.
- ▣ Various meanings of the word *Satva* are found in various texts but the specific meaning of the *Satva* should have to take here as extracted essence / metal for its ore.

DEVELOPMENT OF SATVAP TANA

Civilization

- ▣ According to developmental history of civilization the knowledge regarding copper came first, followed by bronze, gold, silver, lead, tin and lastly iron.
- ▣ It is accepted fact that iron needs very high temperature for its extraction from its minerals/ ores. To achieve this optimum temperature best quality of fuel and blowing devices are essential. Probably such advancement of knowledge might have taken very long time.
- ▣ Thus, in ancient time also people realized that heating is essential to obtain a metal from its compound / mineral.

MEDIEVAL PERIOD

- ▣ In medieval period when the knowledge of Rasa Shastra was developed, the scholars of Rasashastra evolved metal extraction process with their continuous, hard labour and long experimentation.
- ▣ In almost all the classical text of Rasashastra, a very systematic and detailed description of metal extraction process known as Satvapatana is found mentioned.
- ▣ It was thought during the developmental period of Rasashastra that the medicinal properties of various minerals are due to a principle or active substance present in it.
- ▣ Various attempts were made to separate this active principle from the minerals and hence the process is called as satvapatana.

SATVA LAKSHANA

- ▣ Satvapatana mainly consists of heating the mineral in a crucible with intense heat.
- ▣ The substance to be mixed with kshara varga, amla varga, and dravaka varga which are supposed to be used for melting metals.

IMPORTANCE OF SATVA

- ▣ While using uparasaetc in yogas their satva is more beneficial.

CLASSIFICATION

(I) In *Rasasastriyasatvapa tanaKalpa* according to form of *Satvas* are classified into two -

- ▣ (1) *Dh tur pa* (Metal form)
E.g. *Satva* from *Abhraka* and *Svarnam ks)ika*
- ▣ (2) *Adh tur pa* (Non-metallic form)
E.g. *Satva* from *Harat la* and *Somala*

The process of *Satvapa tana* differs according to the nature of *Satva*.

(II) And according to form of dravyas having *Satva*, they can be classified into two-

- ▣ (1) Complex compound ore - e.g. *Abhraka*,
M ks)ika etc.
- ▣ (2) Simple compound ore - e.g. *Malla*, *Sand*, *Gairika* etc.

(III) On the basis of origin, these can be classified as –

- ▣ (1) Mineral - *Abhraka*, *Vaikr nta* etc.
- ▣ (2) Animal – *Bh n ga*
- ▣ (3) Herbal - *Ka kus)t*ha*

(IV) On the basis of *Satvas*, it can be categorized as –

- ▣ (1) Sublimating form of *Satvaseg*. Mercury, Arsenic etc.
- ▣ (2) Non-sublimating form of *Satvas* e.g. Iron, Copper etc.

SUPPORTIVE DRAVYAS USED FOR SATVAP TANA

- ▣ *Ta kana* (Borax), Coal, H₂SO₄
- ▣ These supportive *Dravyas* have the properties like *Ushna*, *T kshna*, *Dh tudr vaka* and *odhan*. They lower the melting point of *Satva* (Metals) present in that ore. Also they act as reducing agents.

YANTRAS USED FOR SATVAP TANA

- ▣ Musha
- ▣ Koshti
- ▣ Kupa and Valukayantra
- ▣ Dhamaruyantra
- ▣ Patanayantra

AIMS OF SATVAP TANA

- ▣ To obtain the active principle of that ore that is free from all blemishes.
- ▣ To minimize dose without lowering its efficacy

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- ▣ To involve it in further procedures like calcinations etc.

PROCEDURE

- ▣ Essential equipments for satvapatana : musha, koshti, reductants and flux/fusion material
- ▣ Vegetable and animal originated materials used during Satva patana which contain carbon are known as reductants. It participate in reduction/dissociations/decomposition of mineral compound. On decomposition of compound metal gets separated.
- ▣ Borax, Silica, Sodium carbonate, Potassium carbonate etc are considered as fusion materials. It also known as liquefying material. With the help of flux, the whole mixture material gets liquefied at appropriate temperature. It also helps in the separation of metal and slag. The remaining reductant and flux material goes in the composition of slag
- ▣ The material taken for Satvapatana should be purified initially.
- ▣ It is then mixed with reductant and flux in appropriate quantity.
- ▣ It is subjected to bhavana with advocated liquids, made into a small ball/pellet, dried, put in a suitable crucible and subjected to intense heating in Koshti/Furnace.
- ▣ Moderate heating should be given initially and gradually it should be increased.
- ▣ Intense heat should be maintained for sufficient duration.
- ▣ When the whole material gets properly liquefied, crucible is taken out and the molten material is poured into a container smeared with oil.
- ▣ On cooling, the metal and slag must be separated carefully.
- ▣ Sufficient time should be given for reduction of the compound.
- ▣ Reduction temperature depends upon the nature of the material/compound.
- ▣ For Abhraka, it is 950⁰C and for Makshika it is 900⁰C.
- ▣ Duration of heating varies according to the amount of material taken for Satva patana.
- ▣ For the melting of metallic content 1350⁰C – 1400⁰C is essential for Abhraka and for Makshika it is 1200⁰C to 1250⁰.
- ▣ This temperature should be maintained for one hour for optimum recovery of Satva.
- ▣ In Rasa texts they used reductants and fluxes and smelting process at high temperature. They also identified specific signs i.e. ShuddhavartaLohavarta and Beejavarta which appear at particular temperature and indicate the melting of material and separation of metallic contents from the liquefied material. The metallic contents of the material is known as satva. The slag portion is called kitta.

USES OF SATVA

According to use, these may be divided into two main divisions i.e.

1. Use of satvas in mercurial processing.
2. Use of satvas in therapeutics
3. For Charana and Jarana Samskara of mercury, satvas are specifically recommended.
4. Mercury can consume and digest only pure metal and not the mineral which is associated with many impurities and probably this may be the reason for advising the use of Satvas in mercurial processings.
5. Abhrakasatva considered best for cutting the wings (pakshachedana) of mercury. In other words, it means that Abhrakasatva if mixed with mercury may make the same thermostable.
6. Abhrakasatva is considered best Anushka for mercury (Rasopanishad). It is an accepted fact that while heating no one can control mercury by any means.
7. In context of mercurial processing's according to Rasa Hridaya Tantra, mercury cannot attain Rasayana property without the paka of Abhraka Satva in it. It is the Abhraka Satva which induces Rasayana quality in mercury. It is further mentioned that Abhraka Satva cannot be made Jaarita (digested) till it is not mixed with Makshika Satva. Hence, the use of Makshika Satva is considered essential for the Jaarana of Abhraka Satva in mercury.

USE OF SATVA IN THERAPEUTICS

- ▣ Satvas are not only useful for mercurial processing but these are equally useful for the therapeutic purposes after subjecting them from Shodhana and Marana. These may prove therapeutically more effective than their minerals.
- ▣ It is also mentioned in texts that those who use Abhraka Satva internally get Vayastambha effect which means these can sustain youthfulness of the body.
- ▣ In some texts, Abhraka Satva is said to possess Rasayana property. According to Rasa RatnaSamucchaya, there is no other better substance in the world than Abhraka Satva, which is harmless, highly potent and superior in properties and effects.

Kinetic chemistry

- Kinetics is the study of the rates of chemical processes in an effort to understand what it is that influences these rates and to develop theories which can be used to predict them.
- A knowledge of reaction rates has many practical applications, for example in designing an industrial process, in understanding the complex dynamics of the

atmosphere and in understanding the intricate interplay of the chemical reactions that are the basis of life.

- At a more fundamental level we want to understand what happens to the molecules in a chemical reaction – that is what happens in a single reactive encounter between two reagent molecules. By understanding this we may be able to develop theories that can be used to predict the outcome and rate of reactions.

Kinetic molecular theory

- All matter is composed of tiny particles
- The particles are in constant motion
- Increased temperature reflects increased motion of particles
- Solids liquids and gases differ in the freedom of motion of their particles in how strongly the particles attract each other

Thermodynamics and kinetics

Thermodynamics and kinetics are two factors that affect reaction rates. The study of energy gained or released in chemical reactions is called thermodynamics, and such energy data are called thermodynamic data. However, thermodynamic data have no direct correlation with reaction rates, for which the kinetic factor is perhaps more important. For example, at room temperature (a wide range of temperatures), thermodynamic data indicates that diamond shall convert to graphite, but in reality, the conversion rate is so slow that most people think that *diamond is forever*.

Chemical kinetics of satvapatana

- ▣ Chemistry i.e. science that deals with the structure and behavior of matter
- ▣ Scientific model i.e. a model simplified approximation of reality
- ▣ Scientific models are simplified but useful representations of something real

CONCLUSION

- ▣ Satvapatana is one type of Samskara
- ▣ Reduction and refining of metals and minerals are done in this procedure
- ▣ Every science matures when it achieves understanding of its basic phenomena.

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