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### RESEARCH ARTICLE

#### HARTAL (ARSENICTRISULPHIDE) A CONCEPTUAL STUDY

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#### **Abstract**

In Rasa Shastra Hartal has an important place. It is mentioned under group Uprasa by many Acharyas.<sup>1</sup> Best Hartal is Gold like in appearance, reddish yellow colour and heavy weight. It is formed of many thin layers, which are one upon another<sup>2</sup>. Hartal is a poisonous substance in which Arsenic is present. Hartal is of two kind :

- A) that which is obtained in Mines.
- B) that which is prepared at laboratory by the combination of Arsenic and Sulphur.

Chemically it is  $As_2S_3$  and called Orpiment in Morden, which is very important indigenous source of Arsenic. Purified Hartal destroys effect of Vitiated Vata, kapha, Rakta and Visha. It is helpful in curing the skin abnormalities, infectious fever (Bhoot Jwara), Shwas, Kasa, Kusht, Vatarakta, Visarpa. Thus the Purified Hartal is considered as a Rasayana. The cessation of menstrual bleeding can be observed even by the use of Hartal as a single drug.<sup>2</sup>

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#### **Introduction:-**

Hartal is one of the important mineral of Rasa Shastra and it has been included in Uparasa Group. Different Rasa-Granthas such as RRS, RHT, Rasa Rasarnava, Rasendra Chudamani, Rasa Prakash Sudhakar, Rasendra Chintamani, Rasendra Sar sangrah, Rasa Manjari, Rasa Kamdhenu, Ayurveda Prakash, Brihad Rasa Raj Sundar and Rasa Tarangini have described Hartal in the classification of Uparasa. However other Acharyas put it into other groups eg. Dhatu, Upadhatu, Parthiva dravya, Mishrakadi Varga etc.

Mainly Hartal is of 2 types :

- 1- Patratal
- 2- Pindatal

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**In both Patratral is best.**

Hartal is found in the nature, in form of mineral and it is widely distributed in nature in various compounds but also artificially formed. Rasa Tarngini describes when the purified Arsenic-oxide (49 Parts) is mixed with purified Gandhaka (24 Parts) in a mortar, then heated in damru yantra, the artificial Hartal is prepared.<sup>3</sup> Today Hartal (As<sub>2</sub>S<sub>3</sub>) is prepared on a large scale in laboratory. It is of Golden colour, Heavy weight, Bright, Glazy and Having several thin layer like mica sheet. It is insoluble in water and concentrated HCl but soluble in alkalis, alkali sulphides and yellow ammonium sulphide.

It is used for the manufacture of Sulphur di-oxide (SO<sub>2</sub>), volatile arsenic tri-oxide and Thioarsenic. Orpiment is used in Pyrotechny (Bengal fire is a mixture of 2 parts of Realgar, 7 parts of Sulphur and 24 parts of Nitrate), useful for removing hair. In the present days Orpiment is also used in the form of Pigments ( A process of painting picture on wall before plaster is dry called "Frescoes"). In medicinal use it cures various diseases esp: skin diseases.

**Classical Description****Synonyms Of Hartal<sup>4,5,6</sup>**

Hindi : Harital (Haratala)

Sanskrit : Haritalam

English : Orpiment / Arsenic Gold Ore / Yellow Arsenic.

Hartal is famous by a lot of names. The synonyms which have been described in various Ayurvedic text are as follows –

Harital—Due to lemon like yellowness.	Chitragandhaka—In which different type of smell comes.
Tal—Which gave taste, glow and health.	Pinjara—Which give yellowness
Talaka—Which gave taste, glow and health.	Vanshapatraka—Pieces like Vansha.
Natbhushan—Face pack of Artists	Aal—Ornament of Artist.
Natmandanaka—Causing glow on the character of play.	Peetnaka—Due to changing the colour of metal into yellow.
Shailushabhushan—Ornaments of mountains.	Mallagandhaja—Originate by the combination of Arsenic and Sulphur.
Vidalaka—Like cat's eye	Romaharan—Due to shedding of the bristle.
Godanti—Due to having the shape of Cow's teeth.	Peeta—With yellow colour
Girijaallita—Presence in to mountains.	Atigandha—In which more smell comes

**Mythological Origin of Hartal**

God Narsingh kills the Daitya Hiranyakashipu at the time of evening. Hiranyakashipu vomit, and from this vomit Hartal originate<sup>7</sup>

**Review of Literature:-****Vedic Literature:**

In the vedic period Rigveda has shlok about the importance of Hartal. According to this, at that time Hartal was not used in medicinal use, but for public welfare it was used for causing rainfall.<sup>8</sup>

**Ancient Literature:**

Brihatrayi, Kashyap Samhita and Bhel Samhita have used Hartal both internally and externally in skin disorders. In Brihatrayi (Charak Samhita, Sushruta Samhita And Astang Hridaya). Hartal is described at many places of different sthanas, for curing many diseases by internally and externally applications.

**Charaka Samhita****Sutra Sthana –**

- a) Chap 3, Shlok 5 – in the use of skin disorder (Kushtha)
- b) Chap 5, Shlok 26 – in the dravya calculation of Shiroverechan , Dhoom.

**Chikitsa Sthana—**

- a. Chap 7, Shlok 114 – in the Kanakkshiri tail for Kushtha treatment.
- b. Chap 9, Shlok 66, 67 – use of Anjanarth varti in Unmada Roga.
- c. Chap 17, Shlok 77, 78 – use of Dhumvarti in Hicca and Swasa Roga.
- d. Chap 18, Shlok 69, 73, 74 – use of Manahshiladi Dhum Varti in Kasa Roga.
- e. Chap 23, Shlok 54 – in Visha Chikitsa as Vishahar Mrittaanjivini Agad.
- f. Chap 23, Shlok 78 – Mahaganhasti Agad.
- g. Chap 26, Shlok 196 – in Trimarm Chikitsa , ingredient of Pitak Churna.

**Sushruta Samhita –****Sutra Sthana –**

- a) Chap 37, Shlok 14 – in the content of Shodhan Varti.
- b) Chap 37, Shlok 19 – in the content of Varna Shohana Tail.

**Chikitsa Sthana –**

- a. Chap 1, Shlok 60 – in the content of Varna Shodhana dravya.
- b. Chap 1, Shlok 97 – in the use of Pandu Karma.
- c. Chap 1, Shlok 105 – Lomshatanarth.
- d. Chap 1, Shlok 108 – Rom Shatanarth.
- e. Chap 2, Shlok 91 – Vrana Shohana Lepa.
- f. Chap 6, Shlok 12 – Arsha Shatanarth Tail.
- g. Chap 9, Shlok 27 – Svitra Chikitsa.
- h. Chap 9, Shlok 55 – Vajrak Tail.
- i. Chap 18, Shlok 19 – Medoja Granthi application.
- j. Chap 19, Shlok 18 – in the Medoja Vrridhi.
- k. Chap 19, Shlok 40 – lepa in Updansha.
- l. Chap 19, Shlok 46 – lepa in Updamsha and Visarpa.
- m. Chap 20, Shlok 6 – in the treatment of skindisorder.
- n. Chap 20, Shlok 21 – in the treatment of Chhardi.
- o. Chap 20, Shlok 28 – in the treatment of Arunshika.
- p. Chap 20, Shlok 59 – lepa on the Ahiputana wound.
- q. Chap 25, Shlok 38 – Vyang nashaka lepa.

**Kalpa Sthana –**

- t) Chap 2, Shlok 5 – in the calculation of metal poison.
- u) Chap 8, Shlok 112 – treatment of Luta Dansha.

**Uttar Tantra**

- v) Chap 11, Shlok 9 – Netranjana Varti.
- w) Chap 21, Shlok 52 – as ear drop in Krimi Karma.
- x) Chap 30, Shlok 7 – Bali Karma in Shakung raha.
- y) Chap 32, Shlok 4 – Putna Pratishdha tail marana.
- z) Chap 33, Shlok 3 – Andha putna pratisheha.
- aa) Chap 35, Shlok 7 – Mukhmanika pratishedha.
- bb) Chap 52, Shlok 22 – Dhoompan in Cough.

**Ashtang Hridaya****Sutra Sthana –**

- a) Chap 24 – Shlok 16 -Putapaka dravyas and methods.

**Chikitsa Sthan-**

- a. Chap 3 – Shlok 67 - Dhoompan dravyas in Kasa.  
 b. Chap 4 – Shlok 11- Dhoompan dravyas in Shwas.  
 c. Chap 19 – Shlok 67 - Mustadi Avachurnana.  
 d. Chap 19 – Shlok 71 - Gugguladi Gharshana.  
 e. Chap 20 – Shlok 13 - Shvitranashak lepa.

**Uttar Sthan –**

- a. Chap 5 –Shlok 2 - HingwadiVarga in Bhootonmad Apasmar.  
 b. Chap 11 – Shlok 53 - Shukrotsedhanjana .  
 c. Chap 13 – Shlok 31 - Timirantkar Anjana.  
 d. Chap 14 – Shlok 30 - Varti Anjana.  
 e. Chap 20 – Shlok 24 - Varti in Nasarsha and Arbuda.  
 f. Chap 22 – Shlok 100 - Pitakachurna.  
 g. Chap 25 – Shlok 49 - Avasadan Karna.  
 h. Chap 25 – Shlok 60 - Tvakshodhana lepa.  
 i. Chap 30 – Shlok 22 - Bhadrashritadi Taila .  
 j. Chap 32 – Shlok 2 - Lepa in Yavaprakhaya.  
 k. Chap 32 – Shlok 31 - Manjishdhadi Sneha.  
 l. Chap 35 – Shlok 24 - Chandrodayanamagad.  
 m. Chap 37 – Shlok 41 - Lepa in Vrishchika Dansha.  
 n. Chap 37 – Shlok 73 - Mandar Agad.

**Chikitsa Granth:**

In Chakradutta, Hartal is useful in Kushtha Roga (Skin Disorders) and Kshudra Roga<sup>R9</sup>, Yogratakara also described the importance of Hartal in Kushtha Chikitsa and Kshudra Roga Chikitsa.<sup>R10</sup>.

**Rasa Granth:**

Almost all texts of Rasashastra have described the Hartal in their texts.

**Nighantu:**

Almost all texts of Nighantu have described Hartal.

**Classification of Hartal**

Most of the Ayurvedic and Rasa texts have mention Hartal mainly under 'Uprasa' varga. But many other Acharyas have accepted it under many other varga.eg.

- |                          |                             |
|--------------------------|-----------------------------|
| 1. Charak Samhita —      | Parthiva Dravya             |
| 2. Sushruta Samhita—     | Dhatu Visha                 |
| 3. Astang Hridaya—       | Dhatu                       |
| 4. Sharangdhar Samhita—  | Updhatu                     |
| 5. Dhanvantari Nighantu— | Uprasa and Mishrakadi Varga |
| 6. Shaligram Nighantu—   | Dhatopadhatu                |
| 7. Kaidev Nighantu—      | Dhatu                       |
| 8. Madanpal Nighantu—    | Swaranadi Varga             |
| 9. Raj Nighantu—         | Swaranadi Varga             |
| 10. Yoga Ratnakar—       | Updhatu                     |

**Varieties of Hartal**

Patratat and Pindatal are the two varieties of Hartal, which have been accepted by most of our learned Acharyas and Rasa Acharyas. Rasayana Sara said 3 varieties (Godanti included), but only BRRS said 4 varieties of Hartal (Godanti and Vakdali included). Detailed description of varieties of Hartal in this table.

S No	Grantha	Patra/Varki	Pinda	Godanti	Vakdali
1	Rasa Tarngini	+	+	-	-
2	Rasa Ratna Samuchchya	+	+	-	-
3	Rasendra Bhaskar	+	+	-	-
4	Rasa Mitra	+	+	-	-
5	Ayurveda Prakah	+	+	-	-
6	Rasendra Chudamani	+	+	-	-
7	Anand Kanda	+	+	-	-
8	Rasa Darpana	+	+	-	-
9	Rasendra Sara Sangraha	+	(Patal)	+	-
10	Rasamritam	+	+	-	-
11	Rasarnava	+	(Patal)	+	-
12	Rasa Prakash Sudhakar	+	(Dala)	+	(Ashma)
13	Rasayana Sara	+	+	+	-
14	Brihad Rasa Raj Sunder	+	+	+	+
15	Bhavprakash Nighantu <sup>11</sup>	+	(Patrakhya/ Tabkiya)	+	-

### 1 Patratat<sup>12,13</sup>

Patratat having following characters, eg:- Peeta-Rakta mixed colour as like Gold, Clear, Heavy weight, Bright, Snigdha and Several thin layer attached like mica sheet. It is superior than Pindatal and acts as a Rasayana.

### 2 Pindatal<sup>12,13</sup>

Pindatal having following characters, eg Splendor less (Brightless), Swalpa satva, without layer, Laghu, Stone like and stop the menstrual blood.

### 3 Godanti Hartal<sup>7</sup>

The description of Godanti Hartal is found in Brihad Rasa Raj Sundar. It is having the shape of cow's teeth, so that it is been called Godanti Hartal. Its colour is yellow with blue streaks at the center and is found in the form of long bars. It is very snigdha. Godanti Hartal is not the actual form of Hartal, So many authours did not include Godanti Hartal into Hartal.

### 4 Vakdali Hartal / Bugdadi Hartal<sup>7</sup>

It is the 4<sup>th</sup> type of Hartal. It is made artificially in modern time. According to Brihad Rasa Raj Sundar, it is very Snigdha and is generally known by the name 'Himprakhya' means appearance like snow. It is made of many layers and heavy in weight. It has property for curing the skin disorders (Kustha).

Today mainly 2 types of Hartal is found, ie Patratat and Pindatal. Godanti and Vakdali Hartal only mention by BRRS, but mostly Rasa and other authors describe only Patratat and Pindatal.

### Qualities of Prashasta Hartal

It is Swarnvarnam (gold like reddish yellow in colour), Guru (Heavy weight), Snigdha (Smooth), Tanupatram (Formed by thin layers), Bhasuram (Bright), Bahupatram (many thin layers, which are one upon another), and Rasayana.

These all properties are found in Patratat which is superior quality of Hartal.

### Complications due to Ashuddha Hartal and their Treatment

The Ashuddha Hartal is hazardous for health. It causes various disease due to imbalance of Vata and Kapha doshas. It causes deposition of waste materials in the body, and destroy the body beauty, also causing death and feared to cause Kushtha. It also causes burning, itching, tremors and pain in the body<sup>3</sup>. Ashuddha Hartal reduce the life and aggravates Kapha and Vata produces Prameha, Daha, Sphota and Angasankoch of the body.<sup>2</sup>

### Treatment of Hartal Toxicity

1- According to Rasa Tarangini – Mishri and Jeerachurna mix with Kushmand swarasa and taken for 3 times in a day.

- 2- According to Rasendra Bhaskar – Yavasa swarasa , Kushmand swarasa and Hansraj swarasa all three mix together and used as drink.

### Shodhan Of Hartal

Different methods have been described for shodhan of Hartal in different Rasa texts. Some most important methods are described in this table

S. No	Method
1	Swedana of Vakri Hartal in Dola Yantra, for 1 yama (3 hrs.) in nimbu swarasa and I yama in Grahadhoom water <sup>14</sup>
2	Swedana of Hartal in Dola Yantra for 1 yama (3 hrs.) in Kushmand Swarasa and 2 yama in lime water or Triphala Kwath <sup>14</sup>
3	Swedana of Hartal in Dola Yantra for 1 yama in Tilkshara Jala <sup>14</sup> .
4	Swedana of Hartal in Dola Yantra for 1 yama in Shalmalimool Swarasa or 7 times bhavna with Shalmalimool Swarasa. <sup>14</sup>
5	7 times bhavna with lime water in Hartal Churna <sup>14</sup>
6	Swedana of Hartal in Dola Yantra with Kushmanad Swarasa or Tilkshara Jala or lime water <sup>2</sup>
7	Hartal is mixed with 1/10 of Tankana Podwer and washed seven-seven times separately with Jambira Swarasa and Kanji . The Swedana of this mixture in Dola Yantra for 1day in Kanji with lime after that 1day in Kushmand Swarasa or Shalmalimoola Swrasa <sup>2</sup>
8	Swedana of Hartal in Dola Yantra for 4 yama (12 hrs.), each yama in Kanji with lime, Kushmand Swarasa, Tila Taila and Triphala Kwath <sup>15</sup>
9	Swedana of Hartal in Dola Yantra for 3 yama (9 hrs.), each yama in Kushmand Swarasa , lime water and Tila Taila <sup>16</sup>
10	Swedana of Hartal in 3 Kushmanda fruits successively. In one time process, Agni of 4 Yama (12 hrs.) is given to fruit, which kept in sharaav so that whole fruit is dissolved into liquid <sup>7</sup>

### Marana Of Hartal

S. No	Method
1	3 Bhavna with Ghan Bhangrimool Kwath then mardana with Mahishmutra and make chakrika. Given 12 puta with 10 vanyopala <sup>2</sup>
2	Mardana with Churnodaka, Apamargamool Swarasa and Ksharodaka. It kept in a sharaav samputa in between Yavakshara. This samputa kept in Kushmand Swarasa filled handi and give 4 prahara (12 hrs.) agni in sequence of mridu, madhya and tivra <sup>16</sup>
3	Mardana with Punarnava Swarasa 1 day and made in round dried form. In handi this round form kept in between Punarnava Kshara / Bhasma then given agni for 5 days in sequence of mridu, Madhya and trivra <sup>15</sup>
4	21 Bhavna with Peepaltvak Kwath in to 5 tola shuddha Hartal and chakrika formed. In Bhasm Yantra chakrika kept in between Peepaltvak Bhasma and given agni for 4 Prahara (12 hrs.) <sup>14</sup>
5	Shuddha Hartal and equal part of Shukti Bhashm , mardana with Kumari Swarasa then Chakrika formed and given laghuputa <sup>14</sup>
6	Mardana of Ghritkumari Swarasa into 1 pala of Shudha Hartal. This dried churna kept in Sharaav samputa. This samputa kept in baluka yantra and given 12 Yama (36 hrs.) agni <sup>17</sup>
7	Mardana with Ashwamutra for 1 month and chakrika formed. These chakrika kept inside the Jimikand and Jimikand kept inside the Tusha and paak with Agni <sup>18</sup>

### Examination Of Hartal Bhasm

- 1- Hartal bhasm when throw the flame, if fumes not came out from bhasm , then it should be uttam bhasm<sup>19</sup>
- 2- Glass bowl taken and pour Lavandrava into it then 1 ratti Hartal bhasm throw into Lavandrava. When glass bowl heated then yellow clolor precipitate settle down on bottom. It should be clear that this bhasm is of Hartal bhasm. If precipitate not settle down then it should be any other metallic bhasm.<sup>20</sup>

### Rasapanchaka

(Pharmacological and Therapeutic Properties Of Shodhita Hartal)<sup>11,16,21</sup>

Rasa – Katu, Tikta , Kashaya

Guna – Snigdha , Ushna , Guru

**Virya** – Ushna

**Vipaka** – Katu

**Karma** – 1) Doshika – Tridoshashamaka

2) Systemic – Deepan , Rasayana, Vishaghna , Vrishya , Balya , Kandughna , Kushthaghna , Purifier of blood , Jwaraghna , Kasaghna , Regulator of menses , Bronchodilator , Katigrahaghna, Insectivorous.

3) Therapeutic – Visha, Kandu, Kushtha, Visarpa, Krimi , Jwara (Bhoot Jwara) Agnimandhya , Kasa , Shwas , Kshaya , Katigraha , Twak-vikara, Bhootbadha and Stri-artava nashak.

### Qualities of Mritataala (Hartal Bhasm)

Hartal bhasm destroy the following diseases e.g. Chronic Phirangjanya roga, Vatarakta, Visarpa, Vipadika, Vicharchika, different types of Kushtha roga, Vishamjwara, Apasmar, Bhagandar, Chronic abscess, Sinus, Visphota and Vata-rakta prakopaka roga .<sup>20</sup>

### Dose

- 1- Purified Hartal / Hartal Bhasm - ¼ – ½ Ratti (31.250 mg – 62.50 mg)<sup>20</sup>
- 2- Equal to 1 Rice matra<sup>19</sup>
- 3- 1/8 Ratti (15.62 mg)<sup>19</sup>
- 4- ¼ Ratti – 1 Ratti (31.250 mg – 125 mg ).<sup>21</sup>

### Anupana / Sahapana

Mishri and Jeerak Churna, Gau-dugdha, Vasa Swarasa, Kumari Swarasa, Haritaki Churna, Guduchyadi kashaya etc.

### Pathya

The Rasa text Ayurveda Prakasha mentions the use of Sathi rice and Cow's milk as a pathya. <sup>R19</sup>

### Apathya

Patients who use Hartal , should avoid the following things : Lavana-Amla-Katu Rasa dravyas, exposure of sun light and fire. The patient who is not in a position to avoid lavana, may use small quantity of Saindhava lavana, because uprasa of Saindhava lavana is Madhur.<sup>19</sup>

### Uses Of Hartal

- 1- After satvapatan of Hartal 'As' is taken out as satva. So Hartal (Orpiment) is very important indigenous source of Arsenic.

### Satvapatan of Hartal : -

- a) Shuddha Hartal filled with Jaipal Satva and Eranda Seeds in a kupi then Satvapatan done for 1 Yama in Baluka Yantra .<sup>22</sup>
- b) Shuddha Hartal 1 Pala , mardan with arka dugdha for 1 day , then mix 1 tola til taila and kept in Baluka Yantra , agni given for 7 prahar(21 hrs). After self cooling take white satva from bottom of Kupi . This process done in open place.<sup>21</sup>
- 2- Generally shuddha Hartal or Hartal bhasma are not given alone . Other herbal powders are mixed with it and administered.

### Some Yogas of Hartal : -

- a) Taalkodayamalhar
- b) Rasamanikya
- c) Siddhamat Hartal
- d) Taalkeshwar Rasa
- e) Siddhataalkeshwar Rasa
- f) Kushthahari TaaleshwarRasa
- g) Raajraajeshwar Rasa
- h) Lankeshwar Rasa
- i) Manikya Rasa
- j) Bhootbhairava Rasa
- k) Vijaybhairava Rasa
- l) Mukhasvitrahar Lepa

- m) Rasashardoola Rasa
- n) Sarveshwar Rasa
- o) Manahshiladi Lepa
- p) Mahataaleshwar Rasa
- q) Brihadgarbhachintamani Rasa
- r) Raajrajeshwar Rasa
- s) Raajtaaleshwar Rasa
- t) Vijayanand Rasa
- u) Pitak Churna

### Modern View Of Hartal

It is an element of group Vth along with Nitrogen Phosphorous, Antimony and Bismuth in the periodic table. Its electronic configuration is  $1S^2, 2S^2, 2P^6, 3S^2, 3P^6, 3D^{10}, 4S^2, 4P^3$ . Thus it is trivalent. Its physical properties are as follows :

1. Atomic Number	: 33
2. Atomic Mass	: 74.922
3. Density in solid	
State (g. per cc)	: 5.73
Atomic Volume (cc)	: 13.1
Atomic Radius (A)	: 1.19
Electron negativity	: 2.0
M. P ( $^{\circ}C$ )	: 81.7 (36 atm)
B. P ( $^{\circ}C$ )	: 613 (sublimes)
4. Heat of fusion	
(K Jmol) $^{-1}$	: 27.7

### History & Occurrence Of Hartal

The yellow mineral Hartal (orpiment) was well known to the ancients. The term "orpiment" is a corrupted term of "auripymnetum" meaning 'Gold Point'. Egyptians used orpiment and Realgar substances as pigments for "Frescoes". In the present days Orpiment is also used in the form of pigments. A process of painting picture on wall before plaster is dry called "Frescoes". The name "arsenikon" given by the Greeks to orpiment. Arsenious sulphide means the 'Male' or "Potent" substance so well known.

The earlier  $As_2S_3$  has been found in Egypt as well as in India. It is widely distributed in nature in various compounds.

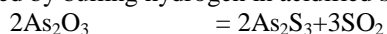
Arsenic occurs in nature mainly as compounds with metal and or sulphur but rarely in the native. The content of arsenic in the Earth's crust amount to  $5 \times 10^{-4}$  percent by weight Sweden possesses the largest reserve of Arsenic ores.

Orpiment is very important indigenous source of Arsenic. Mine of 'Chitalk' where the mineral is exploited by the mines of Country. The orpiment in most cases is also accompanied by Realgar ( $As_2S_2$ ) & fluorspar. But the difficulties in working these mines include the inaccessibility of the area (11,000 to 16,000 ft. height), the harshness of weather and unfavorable condition.

Arsenopyrites has also been found near Darjeeling on Sampthar Hill in the Bhutal Valley Kashmir, In Kumaon large lamps of leucopyrite and Arsenide of Iron have been found in the Hazaribagh district of Bihar.

### Method Of Preparation $As_2S_3$ Of Hartal

- a)  $As_2S_3$  prepared on large scale by subliming a mixture of arsenious oxide and free sulphur. It is readily precipitated by bubbling hydrogen in acidified solution of arsenic chloride.



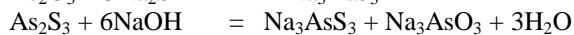
$As_2S_3$  is a lemon yellow solid.

- b) When hydrogen sulphide is passed through arsenious oxide dissolved in hydrochloric acid, the sulphide  $As_2S_3$  is precipitated in golden yellow colour.



**Chemical Property Of Orpiment (As<sub>2</sub>S<sub>3</sub>)**

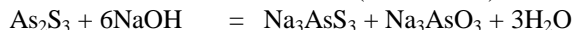
It melt to a red liquid at temperature 310<sup>0</sup>C and boil at above without decomposition. It is insoluble in water and concentrated HCl but dissolves in alkalis, alkali sulphides and yellow ammonium sulphide forming thiosalts from all this solution trisulphide is precipitated back in presence of excess of acid.



These reactions have important bearing on qualitative analysis.



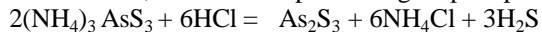
(thioarsenite)



From all these solution trisulphide is precipitated back in presence of excess of acid. These reactions have important bearing on qualitative analysis.



From these thioarsenites, arsenious sulphide is again precipitated on adding HCl.



(Arsenious sulphide)

**Uses Of Orpiment :**

1. Orpiment is used in pyrotechny (Bengal fire is a mixture of 2 parts of Realgar, 7 parts of sulphur and 24 parts of nitrate)
2. Orpiment mixed with slaked lime is useful for removing hair.

**Therapeutical Use of Arsenic**

Oftenly it is used in the chronic skin diseases eg. Psoriasis, Pemphigus, Dermatitis, Herpetiformis etc. It is also used in chronic Myeloid Leukemia.

The acute Arsenic poisoning is known by severe gastrointestinal irritation, vomiting, diarrhea, renal failure and circulatory collapse. The gastrointestinal symptoms usually occurs within an hour after ingestion of the Arsenical compounds which closely resemble that of cholera. The main symptoms are severe vomiting, colicky pain, keen thirst and scanty urine. The vomited material contains first the ordinary contents of stomach, later mucus and blood mixed stool and the frequency of stool becomes more. It becomes dark in color, fetid and bloody, later changes to colorless, odorless and watery resembling the "Rice water stool of Cholera". A severe dehydration occurs, lastly hypoxic convulsions and coma precede to the death of patient. After taking of large dose no symptoms occurs and the death occurs due to shock.

**Treatment And Antidote**

Stomach should be washed with the help of freshly prepared suspension of Ferric hydroxide and the imbalance of electrolytes should be maintained through balanced diet and electrolytes. An intramuscular injection of Dimercaprol (B.A.L.) of 2-3 mg / kg of body wt. is given at a regular 4 hourly intervals for the first 2 days, at 6 hourly on the 3<sup>rd</sup> day and lastly twice daily for next 10 days. Thus full regime of antidote should be given to the patient.

Haemodialysis is essential in the event of renal failure. The treatment of Chronic Arsenic poisoning consists of prolonged administration of specific antidote.

The smallest amount about of 125 mg is fatal for human beings, although the average fatal dose is 180 mg.

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