Indian Alchemy: Rasaśāstra

The systematic science of Indian chemistry — verses from the Rasaratna Samuccaya and the rasa tradition

Systematic APPROACH IN SCIENCE

SANSKRIT VERSE

न क्रमेन विना शास्त्रं
न शास्त्रेण विना क्रमः ।
शास्त्रं क्रमयुक्तं ज्ञात्वा
यः करोति स सिद्धिभाक् ॥

Na kramena vinā śāstram
Na śāstrena vinā kramaḥ
Śāstram kramayutam jñātvā
Yaḥ karoti sa siddhibhāk

Without systematic approach, there is no science, without science there is no systematic approach, one who knows that science is the systematic approach of learning and doing the work, he is known as the scientist/ expert

Source: Rasaratna Samucchaya (6/2)

PHILOSOPHY OF SCIENTIFIC EXPLANATION

SANSKRIT VERSE

नखकृन्तनेन सर्वं काष्र्णायसं विज्ञातम् ।
... काष्र्णायसमित्येव सत्यम् ॥

Nakhakṛntanena sarvaṁ kārṣṇāyasam vijñātam
... kārṣṇāyasam ity eva satyam

When a nail cutter made of iron is explained (or known), then one should know that iron itself is the essence and everything about iron is known (the metallurgical process and quality of iron is known)

TWO TYPES OF ZINC MINERALS

SANSKRIT VERSE

रसको द्विविधः प्रोक्तो
दर्दुर कारवेल्लकः ।
दर्दुरः सत्त्वपाते स्यात्
औषधे कारवेल्लकः ॥

Rasako dvi-vida prokto
Dardura kāravellakaḥ
Dardura satva pāte syāt
Auṣadhe kāravellaka:

There are two types of zinc minerals known as dardura (calamine) and kaaravellaka (smith-sonite). Dardura is ideal for metal extraction and the other is good for medicinal use.

Source: Rasaratna samucchaya 2 -149

THREE TYPES OF ZINC MINERALS

SANSKRIT VERSE

मृत्तिका-गुड-पाषाण-भेदतो रसकः त्रिधा ।
पीतस्तु मृत्तिकाकारो मृत्तिकारसको वरः ।
गुडाभो मध्यमो ज्ञेयः पाषाणाभः कनिष्ठकः ॥

Mrutthika gudapaashana bhedato rasaka sthridhaa
Peethasthu mrutthikakaro mrutthika rasako vara:
Guddabho madhyamo jneya: paashanabha: kanishtika:

There are three types of zinc minerals Mruthikabha (calamine), Guddabha (zincite) and Paashanabha (zinc blende). Among these minerals, the yellow coloured calamines are the best and Guddabha is the medium grade and the Paashanabha is the inferior grade

Source: Rasarnavam 7/29

COLOUR AND NATURE OF MINERALS

SANSKRIT VERSE

पीतका: ताम्रका: ताम्रपीतका: वा भूमिप्रस्थरधातव: ।
भिन्ना नीलरजीमन्तो मुद्गमाषकृषरवर्णा: वा दधिबिन्दुपिण्डचित्रा: ।
हरिद्रा हरितकी पद्मपत्रशैवलकृत् प्लीहानवद्यवर्णा: ।
भिन्नाश्च शुण्डुवलुकालेखाबिन्दुस्वस्तिकवन्त: सगुलिका: अर्चिष्मन्त: ।
स्थाप्यमाना: न भिद्यन्ते बहुफेनधूमाश्च सुवर्णधातव: ।
प्रतीवा पार्थास्ताम्ररूप्यवेदना: ॥

Peethakaa thamrakaa thaamra peethakaa vaa bhumi prasthara dhaathavo.
Bhinnaa neelarajeemantho mudga maasha krusara-varnaa vaa dadhi bhindu pinda chitraa harodraa hareethakee, padma patra saivalyakruth pleehaanavadya varnaa bhinnaschunchuvalukaa lekha bindu svasthikavantha sagulikaa archishmantha sthapyamaanaa na bhidyanthe bahuphena dhoomascha suvarnadhathava: pratheevaa paarthaasthamra roopya vedhana

The colours of the ores of different metals are yellow, mixed copperish yellow, some are powder in nature having the colour of neela rajee flower, green gram, black gram, curd, turmeric, terminalia, leaf of lotus, spleen of animal, sand, jasmine bud, and seed of neem. Some ores, when heated remains the same and some ejects surf and smoke.

Source: Arthasastra 2 -30

COLOUR OF COPPER ORE

SANSKRIT VERSE

भारिक: स्निग्धो मृदुश्च
प्रस्थरधातुभूमिभागो वा ।
पिङ्गलो हरित पाटलो
लोहितो वा ताम्रधातु: ॥

Bharika snigdho mruduscha
prasthara dhathu bhumibhago vaa .
Pingalo haritha paatalo
lohitho vaa thamradhatu

The copper ores are heavy, tawny, green (chalcopyrrites) darkblue (malachite), yellowish tint (azurite), pale red or red (native copper).

Source: Arthasasthra 2/30

THE CHEMICAL KNOWN AS ANJANA

SANSKRIT VERSE

सौवीरमञ्जनं प्रोक्तं
रसाञ्जनमथ परम् ।
स्रोताञ्जनं तदन्यच्च
पुष्पाञ्जनमेव च ।
नीलाञ्जनं च तेषां हि
स्वरूपमिह वर्ण्यते ॥

Souveeramanjanam proktham
rasanjanamatha param
Sthrotho anjam thadanyaccha
pushpanchanakameva cha.
Neelanchanam cha theshaam hi
svaroopam iha varnyate

Souveeramanjanam is (antimony sulphide), rsanjanam (yellow oxide of mercury) sthrotho anjanam (different form of antimony sulphide) neelanjanam (lead sulphide) pushpanjanam (zinc oxide), these anjanas are explained here.

Source: Rasaratna samucchaya 3/98

CALCIUM CARBONATE

SANSKRIT VERSE

पीताभा ग्रन्थिका पृष्ठे
दीर्घवृत्ता वराटिका ।
रसवैद्यैर्विनिदिष्टा
सा चराचर संज्ञिका ॥
सार्धनिष्कभरा श्रेष्ठा
निष्कभरा च मध्यमा ।
पादोननिष्कभरा च
कनिष्ठा परिकीर्तिता ॥

Peethaabhaa granthikaa prushte
deergha vruttha varatikaa.
Rasavaidyair vinidishtaa
saa charachara samjnikaa.
Saardha nishkabharaa sreshtaa
nishkabharaa cha mdhyamaa
Paadona nishkabharaa cha
kanishtaa parikeerthithaa

The calcium carbonate which has the elliptical shape and yellow colour is known as charachara varatika. (depending upon their size and shape) they are clasified as the saardha nishkabhara, which is the best, nishkabharaa the second grade and padona nishkabhara (low grade)

Source: Rasaratna samucchayam: 3/130-131

MERCURY DISTILLATION

SANSKRIT VERSE

दरदः पातनयन्त्रेण
पातितश्च जलाश्रये ।
तत्सत्त्वं सूतसंकाशं
जायते नात्र संशयः ॥

Darada: paathanaa yanthre
paatithascha jalaasraye.
Thathsatvam sootha sankaasam
jaayate naathra samsaya:

Darada: (cinnabar), the ore of mercury, when distilled in a distillation equipment and the vapors when condensed with water, gives the essence of the darada which is the mercury

Source: Rasaratna samucchayam 3/144

EXPLANATION ON THE CORROSION

SANSKRIT VERSE

सुवर्णं रजतं ताम्रं
तीक्ष्णं वङ्गं भुजङ्गकम् ।
लोहं तु षड्विधं तच्च
यथापूर्वं तदक्षयम् ॥

Suvarnam rajatham thaamram
theekshanam vangam bhujangakam.
Lohanthu shadvidham thaccha
yathaapoorvam thadakshayam,

Metals are classified under the class of gold, silver, copper, iron, lead and zinc. The resistance towards corrosion is in the reverse of the above order (the reactivity increases in the above order)

Source: Rasaarnavam 7/97

FLAME TEST

SANSKRIT VERSE

आवर्तमाने कनके पीता
तारे सिता प्रभा ।
शुल्बे नीलनिभा तीक्ष्णे
कृष्णवर्णा सुरेश्वरी ॥
वङ्गे ज्वाला कपोताभा
नागे मलिनधूमका ।
शैले तु धूसरा देवी
आयसे कपिला प्रभा ॥
अयस्कान्ते धूम्रवर्णा
सस्यके लोहिता भवेत् ।
वज्रे नानाविधा ज्वाला
खसत्त्वे पाण्डुरप्रभा ॥

Aavarta maane kanake peethaa
thaare sithaa prabha
Sulbe neelanibhaa theekshne
krishna varnaa suresvaree
Vange jvaalaa kapothaabhaa
nage malinadhoomakaa
Saile thu dhusaraa devee
aayase kapila prabhaa
Ayaskaanthe dhoomra varnaa
sasyake lohithaa bhaveth
Vajre nanaavidhaa jvaala
kha sathve panduraprabhaa

The colour of the flame can be explained as follows for gold: yellow, silver: white, copper: blue, wrought iron: blackish, tin: pigeon colour (ash), zinc: dirty +smoky colour, silicon: white, iron: blackish, iron oxide: brownish, mercury: reddish and diamond: variety of colour and mica: white colour

Source: Rasaarnavam 4/51

THREE TYPES OF IRON

SANSKRIT VERSE

मुण्डं तीक्ष्णं च कान्तं च
त्रिप्रकारमयः स्मृतम् ॥

Mundam, theekshnam cha kaantham cha
triprakaram ayasmrutha:

There are three types of iron: Cast iron (Munda loha), Wrought iron (Theekshana loha) and Carbon steel (Kaantha loha)

Source: Rasaratna samucchayam 5/69

ALPHA AND BETA TIN

SANSKRIT VERSE

खुरकं मिश्रकं चेति
द्विविधं वङ्गमुच्यते ।
खुरकं तत्र गुणैः श्रेष्ठं
मिश्रकं न हितं मतम् ॥
धवलं मृदुलं स्निग्धं
द्रुतद्रावं सगौरवम् ।
निःशब्दं खुरवङ्गं स्यात्
मिश्रकं श्यामशुभ्रकम् ॥

Khurakam misrakam cheti
dvividham vangam-uchyate
Khurakam thathra gunai: sreshtam
misrakam na hitam matham
dhavalam mrudulam snigdham
druthadraavam sagouravam
nissabdam khuravangam syaan
misrakam syaama subhrakam

There are two types of tin known as Khurkam (beta tin) and Misrakam (alpha tin) the beta tin is better in quality and the other one is of low grade and the former is white, soft flexible, low melting, denser and without metallic sound and the Misrakam is blackish white in colour and said to be not acceptable

Source: Rasaratna samucchayam 5/153-154 5

EXPLANATION OF LEAD

SANSKRIT VERSE

द्रुतद्रावं महाभारं
च्छेदे कृष्णसमुज्ज्वलम् ।
पूतिगन्धं बहिः कृष्णं
शुद्धं सीसं अथान्यथा ॥

Drutha draavam mahabharam
cchede krishna samujvalam
poothi gandham bahi krishnam
suddham seesam athoanyathaa

Lead is dense metal having low melting point, when cut, the surface gives black lustre. It has obnoxious odour and black in colour, when exposed to air.

Source: Rasaratna samucchayam 5/170

EXPLANATION OF ZINC METAL

SANSKRIT VERSE

च्छेदे समुज्ज्वलं स्निग्धं
मृदुलं निर्मलं तथा ।
द्रुतद्रावं महाभारं
यसदं ग्राह्यमुच्यते ॥

Cchede samujjvalam snigdham
mrudulam nirmalam thathaa
drutha draavam mahabharam
yasadam grahyamuchyathe

The zinc metal has shining, moistened lustre when cut. It is soft in physical nature, pure in look having low melting point and denser.

Source: Rasatharangini 19/95

ALPHA & BETA BRASS

SANSKRIT VERSE

रीतिका काकतुण्डेति
द्विविधं पित्तलं भवेत् ।
संतप्ता काञ्जिके क्षिप्ता
ताम्राभा रीतिका मता ॥
एवं प्रजायते कृष्णा
काकतुण्डेति सा मता ॥

Reethikaa kaakathundeethi
dvividam pitthalam bhaveth
Santhapthaa kaanchike kshiptaa
thamraabhaa reetikaa matha.
Evam prajaayate krishnaa
kaakathundeeti saa mathaa

There are two types of brass: Reethikaa and Kaakathundee. When dipped in the boiled rice gruel, the Reethikaa type brass gives copper colour and the other one gives black colour

Source: Rasendra choodaamani 14/154

BRONZE

SANSKRIT VERSE

अष्टभागेन ताम्रेण
द्विभाग खुरकेन च ।
विद्रुतेन भवेत्कांस्यं
तत्सौराष्ट्रभवं शुभम् ॥

Ashtabhagena thaamrena
dvibhaga khurakena cha
Vidruthena bhavelkamsyam
thathsourashtrabhavam subham

When eight parts by weight of coper is alloyed with two parts by weight of tin, the bronze is obtained, the brone produced in Sourashtra is said to be best in quality

Source: Rasaratna samucchayam 5/205

A SPECIAL METAL USED FOR MEASURING UV & VISIBLE RAYS

SANSKRIT VERSE

अथाञ्जनीक दशकं
धौम्य द्वादासकं ठथा
नीलञ्जनं षोडसंसं
चर्विमसंसाकं रुरो : १.
जम्वलिकास्थि दशकं
सरकारश्कमेव च
चूर्दसम्सं सुथस्य
नवंसं गैर्कस्य च
वरतिका पचकं च
तत्थथ भगानुसारथ : १.
एतान सम्योज्य मुशायम्
सम्पूर्य विधिवत् क्रमाथ
शद्विमसमथ्युत्थरा पञ्चसथा
कक्ष्योष्णमानाथ: १.
गालायिथ्वाथ यन्त्रास्ये
सेचयेथ अधिवेगथा : १.
च्चाया प्रभविभजकका
लोहस्याल क्रुथक स्था :

Athaanjaneeka dasakam
dhoumya dvaadasakam thathaa
Neelanjanam shodasamsam
charvimsamsakam ruro:
Jamvalikasthi dasakam
sarkarashkameva cha
Churdasamsam suthasya
navamsam gairkasya cha
Varatikaa pachakam cha
thatthath bhagaanusaaratha:
Ethan samyojya mushayaam
sampoorya vidhivath kramath
Shadvimsamathyutthara panchasatha

kakshyoshnamaanatha:
Gaalayithvaatha yanthraasye
sechayeth adhivegatha:
Cchayaa prabhavibhajkaka
lohasyaal kruthaka sthatha:

Graphite (Anjaneekam) 10 parts, ammonium chloride (Dhaumya) 12 parts, Antimony Sulphide (Nilanjana) 16 parts, ash of the bones of deer (Ruruka) 16 parts, ash of Jambalika animal (Jambalika kshara) 10 parts, Silicon dioxide (Sarakara) 9 parts, Mercury (Suta) 5 parts, Ferric oxide (Gairika) 9 parts, Calcium Carbonate 5 parts are mixed and heated to 526 degree to get the “Cchayaprabhavibhajaka loha”.

Source: Yanthra sarvaswam of Bharadvaja Maharishi (109th yanthra)

Courtesy: Dr. N. Gopalakrishnan, Indian Institute of Scientific Heritage