

KYANITE, SILLIMANITE AND ANDALUSITE



# Indian Minerals Yearbook 2022

(Part- III : MINERAL REVIEWS)

61<sup>th</sup> Edition

## KYANITE, SILLIMANITE AND ANDALUSITE

(ADVANCE RELEASE)

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May, 2024

# 17 Kyanite, Sillimanite and Andalusite

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**K**yanite, sillimanite and andalusite are unhydrated aluminosilicate minerals that have the same chemical formula  $Al_2O_3$  but differ in crystal structure and physical properties. When calcined at high temperature around 1,350 °C to 1,380 °C for kyanite and slightly higher for andalusite and sillimanite, these minerals are converted to mullite, ( $3 Al_2O_3 \cdot 2SiO_2$ ) and silica ( $SiO_2$ ) which are refractory minerals.

Synthetic mullite is made by heating mixtures of alumina and silica or bauxite and kaolin at around 1,550 °C to 2,000 °C. Refractories are heat resistant materials used in high temperature applications, such as, furnaces, ladles, kilns, in the metallurgical, glass, chemical, cement and other industries.

The aluminosilicates andalusite, kyanite and sillimanite are metamorphic minerals, which formed in aluminium-rich rocks by orogenic or contact metamorphism. Andalusite is generally preferred to kyanite, because it can be used without calcination, thus saving energy. Most of the world production of andalusite in 2021 originated from France and South Africa.

## RESERVES/RESOURCES

### Kyanite

The total reserves/resources of kyanite as per NMI database, based on UNFC system as on 1.4.2020 in the country has been placed at 105.68 million tonnes. Out of these resources, only 0.84 million tonnes are Reserves and 104.83 million tonnes are under Remaining Resources. Out of total resources, high and medium-grade resources together account for merely 1.44%, low-grade 8.17%, mixed-grade 0.52%, quartz kyanite rock, kyanite gneiss rock & kyanite schist 88.21% and granular, others & not-known grades 1.63%.

Statewise, share of Telangana is 45.75% of the total resources followed by Andhra Pradesh with 30.28%, Karnataka 12.46% and Jharkhand 7.83%. The remaining 3.69% resources are in Kerala, Maharashtra, Rajasthan, Tamil Nadu and West Bengal collectively (Table-1).

### Sillimanite

The total reserves/resources of sillimanite as per NMI database, based on UNFC system in the country as on 1.4.2020 has been placed at 72.26 million tonnes. Out of these resources, 8.26 million tonnes are under Reserves Category, while about 64.00 million tonnes are under the Remaining Resources. Out of total resources, more than 73.89% are granular high-grade, while quartz sillimanite rocks and sillimanite-bearing rocks are about 21.03%. Resources of massive sillimanite of all grades are about 4.80%. The resources are located mainly in Odisha (24.49%), Tamil Nadu (24.01%), Uttar Pradesh (15.84%), Andhra Pradesh (15.32%), Kerala (9.58%) and Assam (6.38%). The remaining 4.38% resources are in Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Rajasthan and West Bengal (Table-2).

### Andalusite

The total reserves/resources of andalusite in the country as on 1.4.2020 as per NMI database, based on UNFC system has been placed at 12.60 million tonnes. Most of the resources are of Reconnaissance category located in Uttar Pradesh (Table-3).

## EXPLORATION & DEVELOPMENT

Details of exploration & development, if any, are covered in the Review of "Exploration & Development" under "General Reviews".

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 1 : Reserves/Resources of Kyanite as on 1.4.2020 (P)**  
**(By Grades/States)**

Grade/State	(In tonnes)												
	Reserves					Remaining Resources					Total Resources (A+B)		
	Proved STD111	Probable STD121	STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221	STD222	Measured STD331	Indicated STD332	Inferred STD333		Reconnaissance STD334	Total Resources (A+B)
<b>All India : Total</b>	<b>3933558</b>	<b>331193</b>	<b>122314</b>	<b>846865</b>	<b>1331061</b>	<b>940452</b>	<b>1864398</b>	<b>561680</b>	<b>3577402</b>	<b>96560462</b>	-	<b>104835455</b>	<b>105682321</b>
<b>By Grades</b>													
High grade	-	-	-	-	-	4317	21867	-	297827	114689	-	438700	438700
Medium grade	325113	-	43449	368562	34540	-	276651	-	34410	371144	-	716745	1085307
Low grade	66562	992	-	67554	691161	29990	1191151	386247	2214900	4063596	-	8577045	8644599
High & medium mixed	-	-	-	-	-	-	-	-	93640	47750	-	141390	141390
Medium & low mixed	-	-	-	-	-	-	-	-	-	48000	-	48000	48000
High, medium & low mixed	-	-	-	-	13097	89650	10606	-	45000	210025	-	368378	368378
Granular	1620	-	-	1620	578	117	-	700	167000	79434	-	247829	249449
Quartz kyanite rock	-	330202	-	330202	-	816378	38000	-	-	81696358	-	82550736	82880938
Kyanite gneiss rock	-	-	-	-	-	-	-	-	-	5370800	-	5370800	5370800
Kyanite schist	-	-	-	-	-	-	-	-	724625	4250000	-	4974625	4974625
Unclassified	63	-	-	63	-	-	-	-	-	-	-	-	63
Others	-	-	78865	78865	591685	-	326123	-	-	73046	-	990854	1069719
Not-known	-	-	-	-	-	-	-	174733	-	235620	-	410353	410353
<b>By States</b>													
Andhra Pradesh	-	-	-	-	-	-	399	-	-	32003829	-	32004228	32004228
Jharkhand	-	331193	-	331193	1017105	920088	523589	-	1754900	3727685	-	7943367	8274560
Karnataka	181600	-	-	181600	230660	15930	119368	386247	1610502	10628753	-	12991460	13173060
Kerala	-	-	-	-	-	-	-	174733	-	10000	-	184733	184733
Maharashtra	210075	-	122314	332389	69621	4317	1210436	-	45000	1734241	-	3063615	3396004
Rajasthan	-	-	-	-	13097	-	10606	-	-	-	-	23703	23703
Tamil Nadu	1683	-	-	1683	578	117	-	700	167000	79434	-	247829	249512
Telangana	-	-	-	-	-	-	-	-	-	48350000	-	48350000	48350000
West Bengal	-	-	-	-	-	-	-	-	-	26520	-	26520	26520

Figures rounded off

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 2 : Reserves/Resources of Sillimanite as on 1.4.2020 (P)**  
**(By Grades/States)**

(In tonnes)

Grade/States	Reserves				Remaining Resources				Total Resources (A+B)					
	Proved	Probable	Total	Feasibility	Measured	Indicated	Inferred	Reconnaissance						
	STD111	STD121	STD122	STD211	STD331	STD332	STD333	STD334						
<b>All India : Total</b>	<b>7968445</b>	<b>3655</b>	<b>290200</b>	<b>8262300</b>	<b>503301</b>	<b>23406</b>	<b>20549508</b>	<b>4771654</b>	<b>17630364</b>	<b>16115664</b>	<b>4411195</b>	<b>64005091</b>	<b>72267391</b>	
<b>By Grades</b>														
Massive high grade	91790	3655	68112	163557	-	-	-	-	-	-	11903	-	11903	175460
Massive medium grade	59084	-	3619	62703	-	4000	-	-	-	-	29705	-	33705	96408
Massive low grade	38000	-	-	38000	15300	-	519	15000	850000	2258786	-	-	3139605	3177605
Massive high & medium	-	-	-	-	-	-	-	-	-	19800	-	-	19800	19800
Massive medium & low	-	-	-	-	-	-	-	-	-	38	-	-	38	38
Granular high	7776113	-	218469	7994582	404001	8336	20548989	2656654	7430300	13794916	561595	45404791	53399373	
Quartz sillimanite rock	-	-	-	-	-	-	-	-	-	-	-	3748000	3748000	3748000
Sillimanite-bearing rock	-	-	-	-	-	-	-	2100000	9350000	-	-	-	11450000	11450000
Others	-	-	-	-	-	11070	-	-	-	-	-	-	11070	11070
Unclassified	3458	-	-	3458	84000	-	-	-	-	-	-	-	84000	87458
Not-known	-	-	-	-	-	-	-	-	64	516	101600	-	102180	102180
<b>By States</b>														
Andhra Pradesh	1451556	-	218469	1670025	-	11070	462830	-	7430300	1491539	-	-	9395739	11065764
Assam	-	-	-	-	-	-	-	-	850000	6700	3748000	-	4604700	4604700
Jharkhand	-	-	-	-	-	-	-	-	-	83000	-	-	83000	83000
Karnataka	-	-	-	-	-	-	-	-	-	982725	-	-	982725	982725
Kerala	553000	-	-	553000	432713	-	-	2564254	-	3369200	-	-	6366167	6919167
Madhya Pradesh	-	-	-	-	-	-	-	-	-	-	-	101600	101600	101600
Maharashtra	174474	3655	3619	181748	15000	-	-	15000	64	516	-	-	30580	212328
Meghalaya	14400	-	68112	82512	-	-	-	-	-	55807	-	-	55807	138319
Odisha	5640985	-	-	5640985	-	-	6557013	-	-	4943600	561595	-	12062208	17703193
Rajasthan	-	-	-	-	300	-	519	-	-	-	-	-	819	819
Tamil Nadu	134030	-	-	134030	55288	12336	13529146	92400	-	3529577	-	-	17218747	17352777
Uttar Pradesh	-	-	-	-	-	-	-	2100000	9350000	-	-	-	11450000	11450000
West Bengal	-	-	-	-	-	-	-	-	-	1653000	-	-	1653000	1653000

Figures rounded off

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 3 : Reserves/ Resources of Andalusite as on 1.4.2020  
(By Grades/ States)**

(In '000 tonnes)

State	Total Reserves	Remaining Resources			Total Resources (A+B)	
	Total (A)	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
<b>All India : Total</b>	-	<b>58040</b>	<b>56210</b>	<b>11800</b>	<b>126050</b>	<b>126050</b>
<b>By Grades</b>						
Low	-	58040	56210	11800	126050	126050
<b>By States</b>						
Jharkhand	-	-	-	11800	11800	11800
Uttar Pradesh	-	58040	56210	-	114250	114250

Figures rounded off

## PRODUCTION & STOCKS

### Kyanite

The production of kyanite was 9,432 tonnes in 2021-22, which is increased by 92% as compared to 4,925 tonnes in the previous year. There were 5 reporting mines in 2021-22 against 4 reporting mines in the previous year. Three principal producers contributed the entire production of kyanite during the year.

In 2021-22, 9432 tonnes, i.e. total production of kyanite was of grade below 40% Al<sub>2</sub>O<sub>3</sub>. About 54% of the total production was reported by the Private Sector (Tables - 4 to 6).

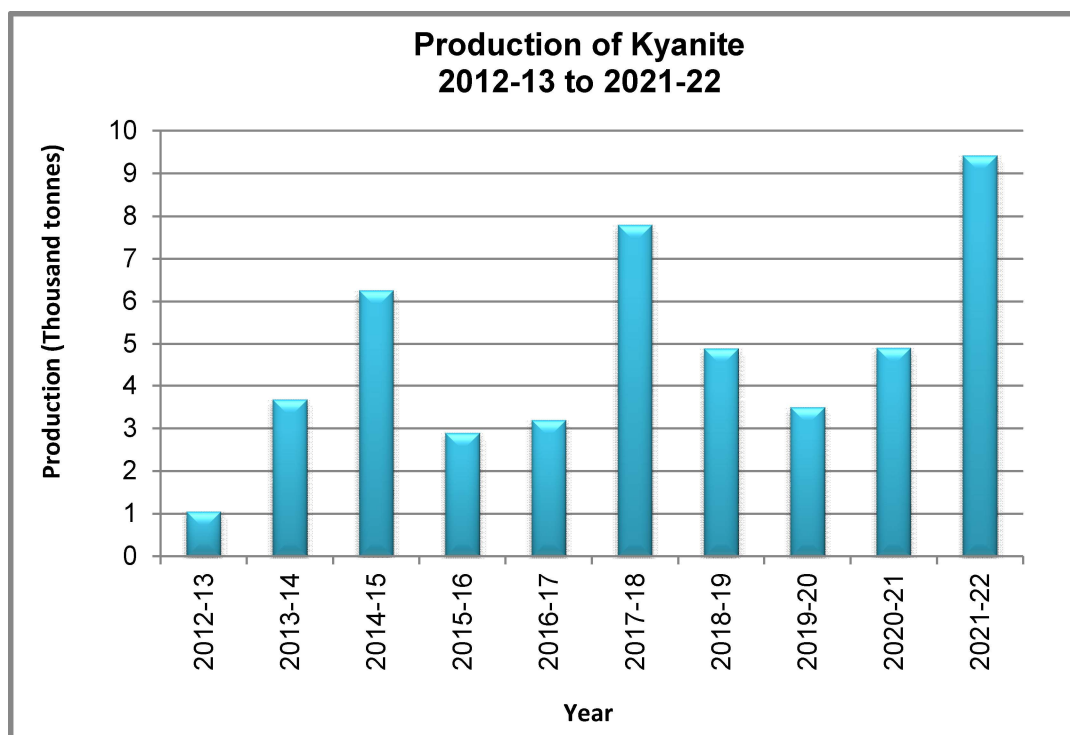
Mine-head closing stocks of kyanite for 2021-22 were 13,745 tonnes as against 11,265 tonnes in 2020-21 (Table-7).

The average daily employment of labour was 89 in 2021-22 as against 61 in the preceding year.

**Table – 4 : Principal Producers of Kyanite, 2021-22**

Name & address of producer	Location of mine	
	State	District
Mohammad Akram Rasheed, 3 Marcha Halli, H.D.Kote Mysore-571 125. Karnataka	Karnataka	Mysore
J S M D C LTD Khanij Bikash Nigam, Nepal House Area Doranda, Ranchi- 834 002, Jharkhand.	Jharkhand	East Singhbhum
Maharashtra State Mining Corporation Ltd., Plot No. 7, Ajani Chowk, Wardha Road, Nagpur - 440 015, Maharashtra.	Maharashtra	Bhandara

KYANITE, SILLIMANITE AND ANDALUSITE



**Table – 5 : Production of Kyanite, 2019-20 to 2021-22  
(By States)**

(Qty in tonnes; Value in ₹'000)

State	2019-20		2020-21		2021-22 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>3498</b>	<b>12728</b>	<b>4925</b>	<b>9251</b>	<b>9432</b>	<b>17578</b>
Jharkhand	-	-	-	-	2899	5417
Karnataka	400	880	3780	7397	5075	9084
Maharashtra	3098	11848	1145	1854	1458	3077

**Table – 6 : Production of Kyanite, 2020-21 and 2021-22  
(By Sectors/States/Districts/Grades)**

(Qty in tonnes; Value in ₹'000)

State/District	No. of mines	2020-21				2021-22 (P)				
		Quantity			Value	No. of mines	Quantity			Value
		40% Al <sub>2</sub> O <sub>3</sub> & above	Below 40% Al <sub>2</sub> O <sub>3</sub>	Total			40% Al <sub>2</sub> O <sub>3</sub> & above	Below 40% Al <sub>2</sub> O <sub>3</sub>	Total	
<b>India</b>	<b>4</b>	<b>605</b>	<b>4320</b>	<b>4925</b>	<b>9251</b>	<b>5</b>	<b>-</b>	<b>9432</b>	<b>9432</b>	<b>17578</b>
Public sector	1	-	540	540	1136	2	-	4357	4357	8494
Private sector	3	605	3780	4385	8115	3	-	5075	5075	9084
<b>Jharkhand</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>2899</b>	<b>2899</b>	<b>5417</b>
Singhbhum East	-	-	-	-	-	1	-	2899	2899	5417
<b>Karnataka</b>	<b>1</b>	<b>-</b>	<b>3780</b>	<b>3780</b>	<b>7397</b>	<b>1</b>	<b>-</b>	<b>5075</b>	<b>5075</b>	<b>9084</b>
Mysuru	1	-	3780	3780	7397	1	-	5075	5075	9084
<b>Maharashtra</b>	<b>3</b>	<b>605</b>	<b>540</b>	<b>1145</b>	<b>1854</b>	<b>3</b>	<b>-</b>	<b>1458</b>	<b>1458</b>	<b>3077</b>
Bhandara	3	605	540	1145	1854	3	-	1458	1458	3077

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 7 : Mine-head Closing Stocks of Kyanite, 2020-21 & 2021-22  
(By States/Grades)**

(Qty in tonnes)

State	2020-21			2021-22 (P)		
	40% Al <sub>2</sub> O <sub>3</sub> & above	Below 40% Al <sub>2</sub> O <sub>3</sub>	Total	40% Al <sub>2</sub> O <sub>3</sub> & above	Below 40% Al <sub>2</sub> O <sub>3</sub>	Total
<b>India</b>	<b>1647</b>	<b>9618</b>	<b>11265</b>	<b>321</b>	<b>13424</b>	<b>13745</b>
Jharkhand	1326	1	1327	-	790	790
Karnataka	-	9440	9440	-	11789	11789
Maharashtra	321	177	498	321	845	1166

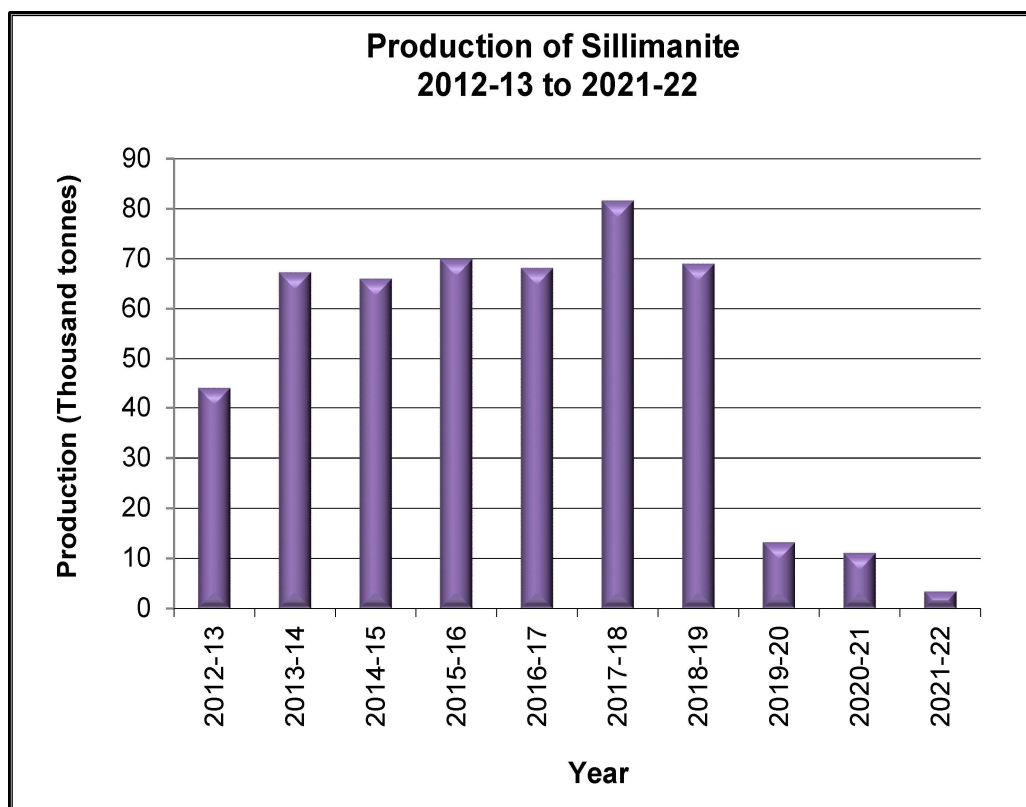
### Sillimanite

The production of sillimanite at 3,432 tonnes in 2021-22 decreased by 69% as compared to 11,110 tonnes in the previous year. There were 2 mines which reported production of sillimanite as an associated mineral with kyanite during the year 2021-22 (Tables-8, 9 & 10).

The whole production of sillimanite was

reported by Private Sector during the year 2021-22. Maharashtra is the only State which contributed cent per cent production of sillimanite during the year 2021-22.

Mine-head closing stocks for the year 2021-22 were 2,920 tonnes as against 1,463 tonnes in the previous year (Table - 11).



KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 8 : Principal Producers of Sillimanite, 2021-22**

Name & address of producer	Location of mine	
	State	District
*Dighori Kyanite Mine, Apna Nagar, Tkiya Ward, Nagpur Road Bhandara, Bhandara-441 904, Maharashtra.	Maharashtra	Bhandara
*Pavri Kyanite Mines, A/1, Indrasagar, Ravindranath Tagore Road, Civil Lines, Nagpur- 440 001, Maharashtra.	Maharashtra	Bhandara

\* Producing as an associated mineral with kyanite

**Table – 9 : Production of Sillimanite, 2019-20 to 2021-22  
(By States)**

(Qty in tonnes; Value in ₹'000)

State	2019-20		2020-21		2021-22 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>13221</b>	<b>37903</b>	<b>11110</b>	<b>13987</b>	<b>3432</b>	<b>7973</b>
Andhra Pradesh	-	-	-	-	-	-
Kerala	-	-	-	-	-	-
Maharashtra	13221	37903	11110	13987	3432	7973
Meghalaya	-	-	-	-	-	-
Odisha	-	-	-	-	-	-

*Note: The main reason for decrease in number of mines is classification of some sillimanite producing mines, as BSM mines in Andhra Pradesh, Kerala and Tamil Nadu. Earlier, these mines were considered under sillimanite mineral as a part of MCDR mineral as there was no separate classification of Beach Sand Minerals (BSM) and Non-Beach Sand Minerals (Non-BSM).*

**Table – 10 : Production of Sillimanite, 2020-21 & 2021-22  
(By Sectors/States/Districts)**

(Qty in tonnes; Value in ₹'000)

State/District	2020-21			2020-21 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>1(2)</b>	<b>11110</b>	<b>13987</b>	<b>(2)</b>	<b>3432</b>	<b>7973</b>
Public sector	1	-	-	-	-	-
Private sector	(2)	11110	13987	(2)	3432	7973
<b>Andhra Pradesh</b>	-	-	-	-	-	-
Srikakulam	-	-	-	-	-	-
<b>Kerala</b>	-	-	-	-	-	-
Kollam	-	-	-	-	-	-
<b>Maharashtra</b>	<b>1(2)</b>	<b>11110</b>	<b>13987</b>	<b>(2)</b>	<b>3432</b>	<b>7973</b>
Bhandara	1(2)	11110	13987	(2)	3432	7973
<b>Meghalaya</b>	-	-	-	-	-	-
Khasi Hills West	-	-	-	-	-	-
<b>Odisha</b>	-	-	-	-	-	-
Ganjam	-	-	-	-	-	-

*Figures in parentheses indicate the number of associated mines with kyanite*

*Note: The main reason for decrease in number of mines is classification of some sillimanite producing mines as BSM mines in Andhra Pradesh, Kerala and Tamil Nadu. Earlier, these mines were considered under sillimanite mineral as a part of MCDR mineral as there was no separate classification of Beach Sand Minerals (BSM) and Non-Beach Sand Minerals (Non-BSM).*



## KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 11: Mine-head Closing Stocks of Sillimanite, 2020-21 & 2021-22 (By States)**

State	2020-21	2021-22 (P)
<b>India</b>	<b>1463</b>	<b>2920</b>
Andhra Pradesh	-	-
Kerala	-	-
Meghalaya	188	188
Maharashtra	1275	2732
Odisha	-	-

### Andalusite

There was no production of andalusite reported since 1988.

## MINING & MARKETING

### Kyanite

Kyanite mines are worked by opencast manual as well as semi-mechanised methods. Generally, the mineral is marketed under three grades: 60% Al<sub>2</sub>O<sub>3</sub> and above, 50 - 60% Al<sub>2</sub>O<sub>3</sub> and less than 50% Al<sub>2</sub>O<sub>3</sub>. These three grades are used in the manufacture of refractories.

### Sillimanite

Sillimanite mines are also worked by opencast method. Pohra mine of Maharashtra State Mining Corporation Ltd is semi-mechanised.

## USES

Kyanite, sillimanite and andalusite are mainly used in refractories and ceramic products because

of their ability to form mullite phase at high temperature. Mullite is an essential component of high-alumina refractories forming the inner lining of furnaces and high temperature vessels widely used in the production of metals, ceramics, glass and cement. These are used in manufacturing refractory products like dense bricks, insulating bricks, monolithic & castables. Sillimanite refractory bricks are extensively used in steel and glass industries and also in ceramics, cement kilns, heat treatment furnaces and petrochemical industries.

## SPECIFICATIONS

BIS has prescribed IS:14301-1995 (reaffirmed in 2011) for kyanite used in Refractory Industry. There are two grades, i.e., Grade-1 and Grade-2. Composition of kyanite under this specification is Al<sub>2</sub>O<sub>3</sub> 58% min. Grade-1 and 54% min. for Grade-2; Fe<sub>2</sub>O<sub>3</sub> 1.50% max., K<sub>2</sub>O + Na<sub>2</sub>O 1% max.; other constituents would be for as agreed between the supplier and purchaser. Pyrometric Cone Equivalent (PCE) specified would have to be not less than 36 for Grade-1 and 35 for Grade-2. Size of the material is 50 to 150 mm or 10 to 50 mm.

BIS has laid down IS:14302-1995 (reaffirmed in 2011) in respect of beach sand sillimanite for use in Refractory Industry, while IS:2045-1962 in respect of natural sillimanite blocks for glass melting tanks furnaces has been withdrawn.

## CONSUMPTION

### Kyanite & Sillimanite

The apparent availability of kyanite and sillimanite during 2021-22 is 9,445 & 1,113 tonnes, respectively (Table-12).

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 12 : Apparent Availability of Kyanite and Sillimanite for Domestic Consumption (Based on Production, Imports and Exports)**

Minerals	(Quantity in tonnes)	
	Kyanite	Sillimanite
	2021-22	2021-22 (P)
I) Total Production	9432	3432
II) Total Imports	1668	801
III) Total Exports	1655	3120
IV) Apparent Availability	9445	1113

## WORLD REVIEW

World reserve of kyanite and related minerals is large in the USA. Andalusite is limited to only a few countries. The main producer and exporter of andalusite is South Africa and Peru while USA and India are the main producers of kyanite. India is the leading producer of sillimanite. World production of kyanite and related minerals is indicated in Table-13.

The availability of inexpensive refractory-grade bauxite from China served to increase demand for refractories from alternative raw material, such as, andalusite. Demand for refractories in iron and steel production is expected to have larger increases in countries with higher growth rates in steel production. Increased demand also is anticipated for refractories used for producing other metals and in the industrial mineral market because of increasing production of cement, ceramics, glass, and other mineral products.

**Table – 13 : World Production of Minerals (Kyanite, Sillimanite & Andalusite) (By Principal Countries)**

Country	(In tonnes)		
	2019	2020	2021
<b>France</b>			
Andalusite <sup>(a)</sup>	68000	65000	65000
<b>India*</b>			
Kyanite <sup>(c)</sup>	3497	4925	4480
Sillimanite <sup>(c)</sup>	13236	11110	11900
<b>Madagascar</b>			
	1	-	-
<b>Nepal</b>			
Kyanite <sup>(d)</sup>	1	-	-
<b>South Africa</b>			
Andalusite	190000	180000	190000
<b>USA</b>			
Kyanite <sup>(b)</sup>	91300	67100	81000

*Source: BGS World Mineral Production, 2017-2021, BGS.*

*(a) May Include other sillimanite minerals.*

*(b) Including related minerals.*

*(c) Years ended 31<sup>st</sup> March following that stated.*

*(d) Years ending 15<sup>th</sup> July of that stated.*

*(e) Estimated.*

*\*India's production during 2019-20, 2020-21 and 2021-22 in respect of kyanite is 3,498 tonnes, 4,925 tonnes & 9,320 tonnes respectively and in respect of sillimanite is 13,221 tonnes, 11,110 tonnes & 3,432 tonnes respectively.*

## FOREIGN TRADE

### Exports

Exports of kyanite during 2021-22 at 1,655 tonnes increased manifold by 557% from 252 tonnes in the previous year. Exports were mainly to UAE (82%), Sri Lanka (6%) and Greece & Turkey (3% each). Exports of sillimanite decreased by 38% to 3,120 tonnes in 2021-22 from 4,998 tonnes in the previous year. Sillimanite was exported mainly to China (83%), Japan (10%), Nepal (4%) and Malaysia (3%). Exports of less than 1% were to Thailand, USA and Angola. Exports of andalusite during 2021-22 increased by 100% to 18 tonnes from 9 tonnes in the previous year. Andalusite was exported solely to UAE (100%) (Tables - 14 to 16).

KYANITE, SILLIMANITE AND ANDALUSITE

**Imports**

In 2021-22, imports of kyanite were at 1,668 tonnes as against 1,238 tonnes in the previous year registering an increase of 35%. Imports of sillimanite were at 801 tonnes which also increased by 32% during 2021-22 as compared to 606 tonnes in the previous year. Imports of andalusite at 10,419 tonnes

decreased by 32% during 2021-22 from that of the previous year. The imports of kyanite were mainly from USA (78%) and China (22%). UAE (48%), Hong Kong (26%) & Ukraine (20 %), were the main suppliers of sillimanite while South Africa (79%), France (19%) were the main suppliers of andalusite in 2021-22 (Tables - 17 to 19).

**Table – 14: Exports of Kyanite  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>252</b>	<b>9033</b>	<b>1655</b>	<b>15376</b>
UAE	12	404	1353	11164
Sri Lanka	-	-	100	1271
Turkey	-	-	46	1234
Greece	216	4871	48	933
Saudi Arabia	10	153	35	365
Nigeria	-	-	52	195
Sudan	-	-	2	131
Zambia	-	-	4	47
Cameroon	-	-	15	36
Bhutan	4	3500	-	-
Other countries	10	105	-	-

Figures rounded off

**Table – 15: Exports of Sillimanite  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>4998</b>	<b>94359</b>	<b>3120</b>	<b>64355</b>
China	4004	72772	2576	50244
Japan	378	12700	314	10405
Malaysia	298	5399	84	1664
Nepal	235	1296	116	1234
Thailand	50	990	25	525
USA	1	62	1	202
Angola	-	-	4	25
Germany	++	2	++	24
Canada	++	10	++	15
UK	++	22	++	9
Other countries	32	1106	++	8

Figures rounded off

**Table – 16: Exports of Andalusite  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>9</b>	<b>476</b>	<b>18</b>	<b>1233</b>
UAE	9	476	18	1233

Figures rounded off

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 17: Imports of Kyanite  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>1238</b>	<b>42080</b>	<b>1668</b>	<b>53418</b>
USA	985	36136	1298	49554
China	180	3823	370	3864
South Africa	54	1442	-	-
UAE	10	282	-	-
Australia	4	228	-	-
Malaysia	5	169	-	-

Figures rounded off

**Table – 18 : Imports of Sillimanite  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>606</b>	<b>11571</b>	<b>801</b>	<b>13972</b>
Hong Kong	200	3890	210	4918
Ukraine	405	7080	160	3518
UAE	-	-	383	3374
USA	++	341	41	946
Spain	-	-	1	687
China	++	80	3	265
Poland	-	-	3	204
Germany	-	-	++	58
Belgium	-	-	++	2
Japan	1	147	-	-
Other countries	++	33	-	-

Figures rounded off

**Table – 19 : Imports of Andalusite  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>15217</b>	<b>428831</b>	<b>10419</b>	<b>344730</b>
South Africa	11762	323009	8191	252706
France	3291	100507	1992	81675
USA	150	4534	160	6001
Spain	-	-	48	3657
Ukraine	-	-	28	681
China	++	71	++	10
UAE	14	643	-	-
UK	++	67	-	-

Figures rounded off

## **FUTURE OUTLOOK**

The demand for high quality raw and calcined sillimanite minerals is closely linked to the need for high performance refractories with increased operational lifespans. As the predominant consumer of refractory products, the Steel Manufacturing Industry provides a reliable market indicator of the demand for sillimanite minerals.

The Asia-Pacific region remains the largest market for refractories. The production of sillimanite is likely to increase in the coming years to meet the demand. China will remain the leading market on global front. Demand for refractory minerals in India is likely to scale up in commensurate with steel production which is also likely to show an increasing trend.

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