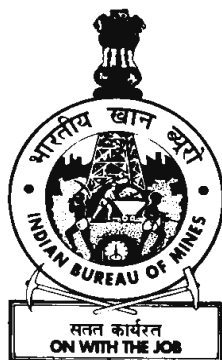


KYANITE, SILLIMANITE AND ANDALUSITE



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(Part- III : Mineral Reviews)

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KYANITE, SILLIMANITE & ANDALUSITE

(FINAL RELEASE)

**GOVERNMENT OF INDIA
MINISTRY OF MINES
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30 Kyanite, Sillimanite and Andalusite

Kyanite, sillimanite and andalusite are three aluminium silicate minerals having the same chemical composition ($\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$) but differing in physical properties. These minerals are also known as 'super-refractories' in view of their special refractory properties. These minerals have special property of undergoing conversion into mullite ($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$) and vitreous silica (crystalite) on heating between $1,350^\circ\text{C}$ and $1,500^\circ\text{C}$. The conversion takes place with about 20% increase in volume and hence it is necessary to calcine these minerals before use. Mullite (artificial) is the most important constituent of refractory products as it shows little or no softening below its melting point ($1,810^\circ\text{C}$). After calcination of these minerals the mullite obtained is characterised by good high temperature insulation of electricity, increase in firing range and temperature, high mechanical strength, low thermal expansion, good resistance to thermal shock of cooling and heating, and good resistance to corrosion. It also does not spall. It is not a plastic mineral and is mixed with clay to make refractory products for electrical insulators and spark plugs, glass furnaces, tanks and pots, furnaces for high melting point alloys and pottery kiln linings, saggers and laboratorywares.

RESOURCES

Kyanite

The total resources of kyanite as per UNFC system in the country as on 1.4.2010 are placed at 103.24 million tonnes. Out of these resources, only 1.57 million tonnes are the reserves and 101.67 million tonnes are the remaining resources. Out of total resources, high and medium-grade resources together are merely 1.5%, low grade 7.6%, mixed grade 0.8%, quartz kyanite gneiss

and kyanite schist rock 88.6% and granular, others and not-known grades 1.6%. Statewise, the share of Andhra Pradesh alone is more than 78% of total resources followed by Karnataka 13% and Jharkhand 6%. Remaining 3% resources are in Kerala, Maharashtra, Rajasthan, Tamil Nadu and West Bengal (Table - 1).

Sillimanite

The total resources of sillimanite as per UNFC system in the country as on 1.4.2010 are placed at 66.98 million tonnes. Out of these resources, the reserves are only 4.08 million tonnes, while about 62.90 million tonnes are the remaining resources. Out of total resources, more than 72.1% are granular high-grade, while quartz sillimanite rocks and sillimanite bearing rocks are about 22.7%. Resources of massive sillimanite of all grades are about 5.0%. The resources are located mainly in Tamil Nadu (27%), Odisha (20%), Uttar Pradesh (17%), Andhra Pradesh (14%), Kerala (11%) and Assam (7%). Remaining 4% resources are in Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Rajasthan and West Bengal (Table-2).

Andalusite

The total resources of andalusite in the country as on 1.4.2010 as per UNFC system are placed at 18.5 million tonnes. There are no reserves. The resources are of inferred category located in Uttar Pradesh and Jharkhand (Table-3).

EXPLORATION & DEVELOPMENT

The exploration was also carried out by Directorate of Geology, Odisha for heavy minerals like ilmenite, rutile, sillimanite, garnet, zircon, etc. Details of exploration are furnished in Table-4.

KYANITE, SILLIMANITE AND ANDALUSITE

Table – 1 : Reserves/Resources of Kyanite as on 1.4.2010
(By Grades/States)

(In tonnes)

Grade/State	Reserves				Remaining resources						Total resources (A+B)		
	Proved STD111	Probable STD121	STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334		Total (B)	
All India : Total	551529	524485	498839	1574853	322622	25917	1238407	578607	3590902	95914312	-	101670767	103245620
By Grades													
High grade	-	-	-	-	-	4317	21867	-	297827	114689	-	438700	438700
Medium grade	266698	-	83851	350549	33295	-	252334	-	34410	430511	-	750550	1101099
Low grade	17609	-	12663	30272	276230	21600	953600	386247	2228400	3948492	-	7814569	7844841
High & medium mixed	-	100550	53103	153653	-	-	-	-	93640	106928	-	200568	354221
Medium & low mixed	-	-	-	-	-	-	-	-	-	48000	-	48000	48000
High, medium & low mixed	-	89650	-	89650	13097	-	10606	-	45000	210025	-	278728	368378
Granular	-	-	-	-	-	-	-	-	167000	81359	-	248359	248359
Quartz kyanite rock	-	-	-	-	-	-	-	-	-	81105358	-	81105358	81105358
Kyanite gneiss rock	-	-	-	-	-	-	-	-	-	5370800	-	5370800	5370800
Kyanite schist	-	-	-	-	-	-	-	-	724625	4250000	-	4974625	4974625
Others	-	-	-	-	-	-	-	-	-	12530	-	12530	12530
Not-known	267222	334285	349222	950729	-	-	-	192360	-	235620	-	427980	1378709
By States													
Andhra Pradesh	-	-	-	-	-	-	399	-	-	80353829	-	80354228	80354228
Jharkhand	267222	524485	402325	1194032	-	-	41384	-	1754900	3040283	-	4836567	6030599
Karnataka	-	-	-	-	309525	21600	18843	386247	1610502	10688721	-	13035438	13035438
Kerala	-	-	-	-	-	-	-	192360	-	10000	-	202360	202360
Maharashtra	284307	-	96514	380821	-	4317	1167175	-	58500	1713600	-	2943592	3324413
Rajasthan	-	-	-	-	13097	-	10606	-	-	-	-	23703	23703
Tamil Nadu	-	-	-	-	-	-	-	-	167000	81359	-	248359	248359
West Bengal	-	-	-	-	-	-	-	-	-	26520	-	26520	26520

Figures rounded off.

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 2: Reserves/Resources of Sillimanite as on 1.4.2010
(By Grades/States)**

(In tonnes)

Grade/States	Reserves				Remaining resources					Total resources (A+B)			
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332		Inferred STD333	Reconnaissance STD334	Total (B)
		STD121	STD122			STD221	STD222						
All India : Total	1693000	1602228	789824	4085052	317869	124000	20082855	4579816	17795772	16152473	3849600	62902385	66987437
By Grades													
Massive high grade	-	-	-	-	-	-	-	-	-	11903	-	11903	11903
Massive medium grade	-	-	-	-	-	4000	-	-	-	29705	-	33705	33705
Massive low grade	5139	-	2056	7195	300	-	519	-	850000	2259814	-	3110633	3117828
Massive high & medium	-	-	-	-	-	-	-	-	-	19800	-	19800	19800
Massive medium & low	140005	-	56002	196007	-	-	-	-	-	1120	-	1120	197127
Massive high, medium & low	-	-	-	-	-	-	-	-	-	38	-	38	38
Granular high	1547856	1602228	731766	3881850	317569	120000	20082336	2479816	7595708	13829577	-	44425006	48306856
Quartz sillimanite rock	-	-	-	-	-	-	-	-	-	-	3748000	3748000	3748000
Sillimanite bearing rock	-	-	-	-	-	-	-	2100000	9350000	-	-	11450000	11450000
Not-known	-	-	-	-	-	-	-	-	64	516	101600	102180	102180
By States													
Andhra Pradesh	518000	-	170000	688000	-	-	-	-	7430300	1526200	-	8956500	9644500
Assam	-	-	-	-	-	-	-	-	850000	6700	3748000	4604700	4604700
Jharkhand	-	-	-	-	-	-	-	-	-	83000	-	83000	83000
Karnataka	-	-	-	-	-	-	-	-	-	982725	-	982725	982725
Kerala	698056	-	-	698056	317569	120000	-	2479816	165408	3369200	-	6451993	7150049
Madhya Pradesh	-	-	-	-	-	-	-	-	-	-	101600	101600	101600
Maharashtra	145144	-	58058	203202	-	-	-	-	64	2664	-	2728	205930
Meghalaya	-	-	-	-	-	-	-	-	-	55807	-	55807	55807
Odisha	-	1602228	-	1602228	-	-	6557013	-	-	4943600	-	11500613	13102841
Rajasthan	-	-	-	-	300	-	519	-	-	-	-	819	819
Tamil Nadu	331800	-	561766	893566	-	4000	13525323	-	2100000	3529577	-	17058900	17952466
Uttar Pradesh	-	-	-	-	-	-	-	-	-	-	-	11450000	11450000
West Bengal	-	-	-	-	-	-	-	-	-	1653000	-	1653000	1653000

Figures rounded off.

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 3 : Reserves/ Resources of Andalusite
as on 1.4.2010**

(In '000 tonnes)

State	Total reserves	Remaining resources		Total resources (A+B)
	(A)	Inferred STD333	Total (B)	
All India : Total	-	18450	18450	18450
By States				
Jharkhand	-	4000	4000	4000
Uttar Pradesh	-	14450	14450	14450

**Table – 4 : Reserves/ Resources for Kyanite, Sillimanite
and Andalusite, 2011-12 as on 1.4.2010**

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Directorate of Geology Odisha							
Puri	Balarampur	1:2,000	0.92	200 Auger drill	2000 m	2000	The area comprises of loose clayey sand and sticky clay belonging to Quaternary. The sandy horizon around Balarampur extends for 1200 m in length with an average width of 750 m heavy minerals occurs within the sandy horizon up to a depth of 10 m. Mineralisation is associated with inland dunes. Resources were not estimated.
- do - Ganjam & Puri	Along coastal track	-	-	121 Auger drill	280 m	659	Resources were not estimated.

PRODUCTION, STOCKS & PRICES

Kyanite

The production of kyanite at 4,064 tonnes in 2011-12, decreased by 32% as compared to the previous year due to closure of some mines, forest problems, pending of renewal and lack of demand. There were 2 reporting mines during the year under review as against 5 mines in the previous year. The entire production was reported from public sector during 2011-12 as compared to 70% in the preceding year (Tables- 5 & 6).

In 2011-12 about one percent of the total production of kyanite was of grade above 40% Al_2O_3 and the rest 99% was of below 40% Al_2O_3 grade.

Jharkhand State Mineral Development Corp. Ltd alone accounted for about 99% of the total production during the year under review. Remaining one percent was the contribution of a public sector mine in Maharashtra (Table- 7).

Mine-head stocks at the end of 2011-12 were 8,154 tonnes as against 1,977 tonnes at the beginning of the year (Table - 8).

The average daily employment of labour was 34 in 2011-12 as against 127 in the preceding year. Prices of kyanite are furnished in the General Review on Prices.

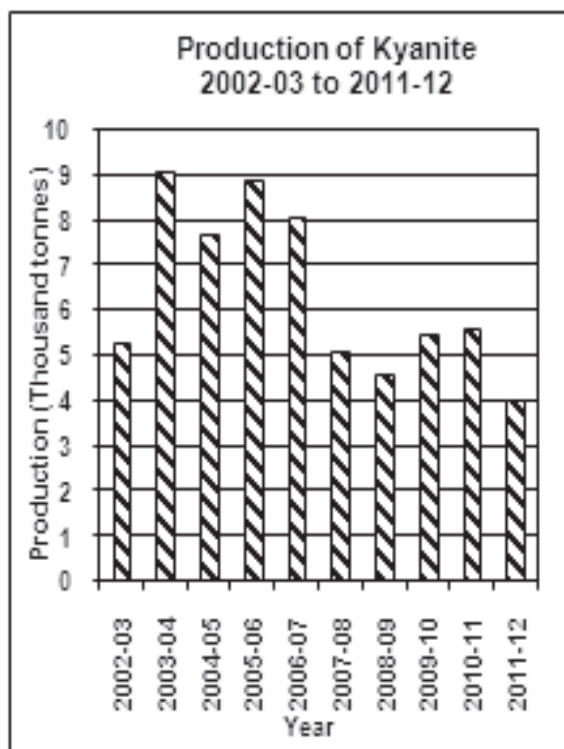


Table – 5 : Producers of Kyanite, 2011-12

Name & address of producer	Location of mine	
	State	District
Jharkhand State Mineral Development Corp. Ltd, Khanij Nigam Bhawan, Nepal House Area, P.O. Doranda, Ranchi - 834 002, Jharkhand.	Jharkhand	Singhbhum (East)
Maharashtra State Mining Corporation Ltd, Plot No. 7, Ajni Chowk, Wardha Road, Nagpur - 440 015, Maharashtra.	Maharashtra	Bhandara

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 6 : Production of Kyanite, 2009-10 to 2011-12
(By States)**

(Qty in tonnes; value in ₹'000)

State	2009-10		2010-11		2011-12 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	5495	5812	5954	6291	4064	4802
Jharkhand	4420	4862	3547	4207	4011	4757
Maharashtra	1075	950	2407	2084	53	45

**Table – 7 : Production of Kyanite, 2010-11 and 2011-12
(By Sectors/States/Districts/Grades)**

(Qty in tonnes; value in ₹ '000)

State/District	No. of mines	2010-11				Value	2011-12 (P)			
		Quantity			Value		Quantity			Value
		Above 40% Al ₂ O ₃	Below 40% Al ₂ O ₃	Total			Above 40% Al ₂ O ₃	Below 40% Al ₂ O ₃	Total	
India	5	2072	3882	5954		6291	2	49	4015	
Public sector	3	296	3882	4178	4696	2	49	4015	4064	4802
Private sector	2	1776	-	1776	1595	-	-	-	-	-
Jharkhand	1	-	3547	3547	4207	1	-	4011	4011	4757
Singhbhum (East)	1	-	3547	3547	4207	1	-	4011	4011	4757
Maharashtra	4	2072	335	2407	2084	1	49	4	53	45
Bhandara	4	2072	335	2407	2084	1	49	4	53	45

**Table – 8 : Mine-head Stocks of Kyanite, 2011-12 (P)
(By States/Grades)**

(Qty in tonnes)

State	At the beginning of the year			At the end of the year		
	Above 40% Al ₂ O ₃	Below 40% Al ₂ O ₃	Total	Above 40% Al ₂ O ₃	Below 40% Al ₂ O ₃	Total
India	95	1882	1977	85	8069	8154
Jharkhand	-	1327	1327	-	1327	1327
Karnataka	-	-	-	-	6444	6444
Maharashtra	95	555	650	85	298	383

KYANITE, SILLIMANITE AND ANDALUSITE

Sillimanite

The production of sillimanite at 58,043 tonnes in 2011-12 reported an increase of 19% as compared to that in the previous year due to increase in demand. There were 4 reporting mines in both the years. Besides, one mine reported production of sillimanite as an associated mineral with garnet during 2011-12.

Three principal producers contributed the entire production. About 45% production of sillimanite was reported by the public sector, while the remaining 55% production was reported by the private sector. Andhra Pradesh, the main producing state contributed as much as 55% of the total output of sillimanite in 2011-12 followed by Odisha 30%, Kerala 13% and Maharashtra 2% (Tables - 9 to 11).

Mine-head stocks at the end of the year 2011-12 were 20,032 tonnes as against 9,599 tonnes at the beginning of the year (Table - 12).

The average daily employment of labour during 2011-12 was 1,763 as against 1,790 in the previous year. Domestic prices of sillimanite are furnished in the General Review on Prices.

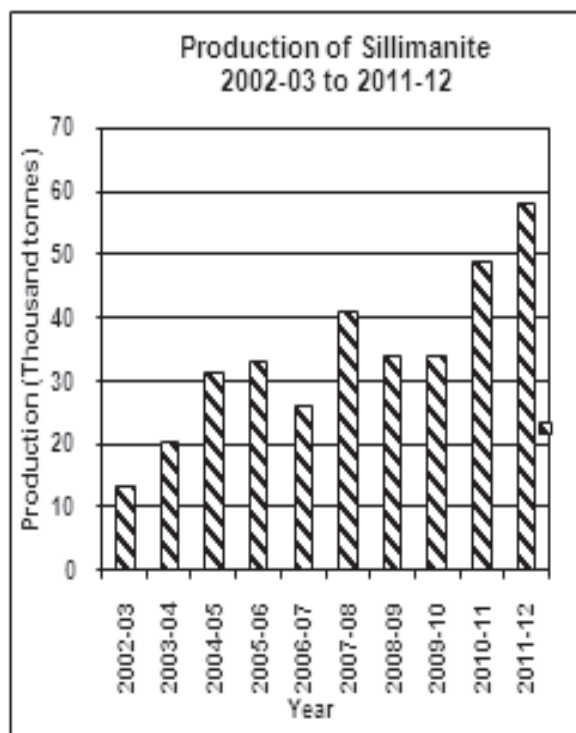


Table – 9 : Producers of Sillimanite, 2011-12

Name & address of producer	Location of mine	
	State	District
Indian Rare Earths Ltd, Plot No. 1207, Veer Sawarkar Marg, Near Siddhi Vinayak temple, Prabhadevi, Mumbai-400 028, Maharashtra.	Odisha	Ganjam
	Kerala	Kollam
Trimex Sands Private Limited, 3rd Floor, Serene Tower, Banjara Hills, Hyderabad. Andhra Pradesh.	Andhra Pradesh	Srikakulam
Maharashtra State Mining Corp. Ltd, Plot No.7, Ajni Chowk, Nagpur - 440 015. Maharashtra.	Maharashtra	Bhandara

Table – 10 : Production of Sillimanite, 2009-10 to 2011-12 (By States)

(Qty.in tonnes; value in ₹'000)

State	2009-10		2010-11		2011-12(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	33687	258779	48784	407406	58043	521094
Andhra Pradesh	2025	12454	17849	136438	31992	280136
Kerala	7939	75460	8243	89981	7578	83028
Maharashtra	9539	7093	4653	3652	984	1754
Odisha	14117	163009	17889	175742	17489	156176
Tamil Nadu	67	763	150	1593	-	-

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**Table – 11 : Production of Sillimanite, 2010-11 and 2011-12
(By Sectors/States/Districts)**

(Qty in tonnes; value in ₹'000)

State/District	2010-11			2011-12 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	4(4)	48784	407406	4(1)	58043	521094
Public sector	4(1)	26911	268150	4	26051	240958
Private sector	(3)	21873	139256	(1)	31992	280136
Andhra Pradesh	(1)	17849	136438	(1)	31992	280136
Srikakulam	(1)	17849	136438	(1)	31992	280136
Kerala	1	8243	89981	1	7578	83028
Kollam	1	8243	89981	1	7578	83028
Maharashtra	2(2)	4653	3652	2	984	1754
Bhandara	2(2)	4653	3652	2	984	1754
Odisha	1	17889	175742	1	17489	156176
Ganjam	1	17889	175742	1	17489	156176
Tamil Nadu	(1)	150	1593	-	-	-
Kanyakumari	(1)	150	1593	-	-	-

Figures in parentheses indicate the number of associated mines.

**Table – 12 : Mine-head Stocks of Sillimanite
2011-12(P)
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
India	9599	20032
Andhra Pradesh	926	8537
Kerala	1180	3227
Maharashtra	1147	1187
Odisha	6144	7081
Tamil Nadu	202	-

Andalusite

There was no production of andalusite in the country 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: above 60% Al₂O₃, 50-60% Al₂O₃ and less than 50% Al₂O₃. 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.

Granular sillimanite is obtained from beach sands in Kerala, Odisha and Tamil Nadu, as a by-product, along with ilmenite, rutile, zircon, garnet, etc. while recovering monazite. The Odisha Sands Complex of IREL in the coastal region of Chatrapur in Ganjam

district, Odisha, has the capacity to recover 10,000 tpy granular sillimanite at present. At Chatrapur, mining is carried out by suction dredging with gravel pump. IREL's Chavara plant in Kollam district, Kerala, presently has an installed capacity of 10,000 tpy granular sillimanite, whereas that at Manavalakurichi in Tamil Nadu presently has not reported installed capacity to recover sillimanite.

At Chavara in Kerala, beach sand mining operations are carried out by IREL in two stages: (i) by means of bulldozers and wheel loaders, and subsequently loading by front-end loaders, wheel loaders and belt conveyors; and (ii) upgrading it to around 93% heavy minerals at Dredge and Wet Concentration Plant and concentrate upgrading unit. The Mineral Recovery Plant (MRP) essentially consists of a dredging system to mine the deposit and a pre-concentration system to separate the valuable minerals and dispose of the waste at the same place from where it was mined. The two systems are mounted on a combined floating platform which keeps moving with the progress of mining. For details regarding mining and processing, etc. of beach sand minerals, review on 'Ilmenite and Rutile' may be referred.

USES

Kyanite, sillimanite and andalusite are mainly used in refractories because of their ability to form mullite phase at high temperature. These are used to manufacture 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 2010) for kyanite used in refractory industry. There are two grades i.e. Grade-1 and Grade-2. Composition of kyanite under this specification is Al₂O₃ 58% min for Grade-1 and 54% min for Grade-2; Fe₂O₃ 1.50% max, K₂O + Na₂O 1% max; other constituents as agreed between the supplier and purchaser and PCE 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 2010) 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

Reported consumption of kyanite estimated at 3,900 tonnes in 2011-12 which remained static. Entire consumption of kyanite was accounted for by the refractory industry.

Sillimanite

Reported consumption of sillimanite estimated at 12,700 tonnes in 2011-12 increased by about 2% over the previous year. Refractory industry alone accounted for about 94% consumption (Table-13).

Table – 13 : Reported Consumption of Kyanite and Sillimanite 2009-10 to 2011-12 (By Industries)

Industry	(In tonnes)		
	2009-2010	2010-11(R)	2011-12(P)
Kyanite			
All Industries	4400	3900	3900
Refractory	4400(23)	3900(20)	3900(20)
Sillimanite			
All Industries	14400	12500	12700
Abrasive	-(1)	100(1)	100(1)
Ceramic	200(3)	400(4)	400(4)
Chemical	200(1)	200(1)	200(1)
Foundry	++(1)	++(1)	++(1)
Refractory	14000(23)	11800(23)	12000(21)

Figures rounded off.

Figures in parentheses denote the number of units in organised sector reporting* consumption.

(* includes actual reported consumption and/or estimates made wherever required).

WORLD REVIEW

World reserve of kyanite and related minerals is large in USA. Andalusite is limited to only a few countries. The main producer and exporter of andalusite is South Africa. The USA and India are the main producers of kyanite. Kyanite Mining Corp. in USA is, by far, the largest producer of kyanite, with an estimated production of about 93,000 tpy. India is the leading producer of sillimanite. World production of kyanite and related minerals is given in Table-14.

Table – 14 : World Production of Kyanite and Related Minerals (By Principal Countries)

Country	(In tonnes)		
	2009	2010	2011
Brazil			
Kyanite ^{(e)(b)}	200	200	200
France			
Andalusite ^(e)	65000	65000	65000
India*			
Kyanite	5495	5569	4064
Sillimanite	33687	47671	58579 ¹
South Africa			
Andalusite ^e	245000	245000	295000
USA			
Kyanite ^(a)	71000	93000	95000

Source: World Mineral Production, 2007-2011.

(a). Including related minerals.

(b). Including beneficiated & directly shipped material.

* India's production of kyanite during 2009-10, 2010-11 and 2011-12 was 5,495 tonnes, 5,954 tonnes and 4,064 tonnes, respectively, while that of sillimanite was 33,687 tonnes, 48,784 tonnes and 58,043 tonnes, respectively.

A steady increase in the world's steel industry the main producers of andalusite China, Peru and South Africa expanded their operations and new andalusite mine was developed in Spain.

Peru

In northern Peru, Andalusita S.A. (a subsidiary of Refractories Peruanos S.A.) continued development and production from its andalusite resources within unconsolidated sand and gravels of the Tablazo Mancora flood plain and evaluation of other unproven mineral resources in northwestern Peru.

South Africa

Andalusite Resources (Pty.) Ltd mined andalusite at its Maroeloesfonte Mine in Thabazimbi, Limpopo Province. The mine life is expected to be 60 years at 70,000 tonnes per year production.

Damrec SA (a subsidiary of Imerys, Paris, France) produced more than 70% of the andalusite production in South Africa. Samrec (Pty.) Ltd operated the fourth mine in Mpumalanga region near Lydenburgh. Rhino Minerals (Pty.) Ltd operated three mines of Damrec's four South African Mines.

Spain

Picobello Andalucita SL which was non operational in past started operations in 2011. The mine is 15 km from El Ferrol port northwest of Galicia. The mine life is expected to be 15 years. The ore will be extracted to a depth of 20 to 40 m at a rate of 65,000 tonnes per year.

FOREIGN TRADE

Exports

In 2011-12, one tonne kyanite was exported mainly to Nepal. Exports of sillimanite increased to 11,829 tonnes in 2011-12 from 2,202 tonnes in the previous year. Sillimanite was exported mainly to China, Bangladesh, Oman and Japan. No exports of andalusite were reported during 2011-12 (Tables - 15 to 17).

Imports

In 2011-12, imports of kyanite were 260 tonnes as against 504 tonnes in the previous year. Imports of sillimanite were 14 tonnes in 2011-12 as compared to 1,363 tonnes in the previous year. Imports of andalusite increased to 6,121 tonnes in 2011-12 from 5,515 tonnes in the previous year. USA was the main supplier of kyanite and Nepal that of sillimanite while South Africa was the main supplier of andalusite in 2011-12 (Tables - 18 to 20).

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

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	3	42	1	11
Nepal	1	3	1	11
Other countries	2	39	-	-

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

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	2202	29024	11829	108615
China	894	11439	8513	82224
Japan	208	3984	336	6669
Iran	171	5369	174	5913
Tanzania	384	3636	330	3809
Singapore	304	2020	323	2587
Kuwait	41	370	84	1253
Oman	30	88	552	1248
Bangladesh	-	-	615	1176
Greece	25	339	75	1092
Thailand	52	900	70	1022
Other countries	93	879	757	1622

KYANITE, SILLIMANITE AND ANDALUSITE

**Table – 17 : Exports of Andalusite
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	40	96	-	-
Nepal	40	96	-	-

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

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	504	11318	260	14765
USA	440	8567	151	6524
Nepal	19	2116	29	4759
Germany	-	-	21	2312
China	20	385	19	411
UK	-	-	20	397
Netherlands	-	-	20	362
Other countries	25	250	-	-

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

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1363	15992	14	2265
Nepal	28	2312	12	1257
Japan	-	-	2	994
China	-	-	++	14
Other countries	1335	13680	-	-

**Table – 20 : Imports of Andalusite
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	5515	104883	6121	131788
South Africa	4675	87945	5654	118846
France	703	14349	273	8027
Peru	97	2174	74	1776
China	-	-	72	1616
Rep. of Korea	-	-	24	713
Brazil	-	-	24	683
Nepal	-	-	++	127
Other countries	40	415	++	++

FUTURE OUTLOOK

As per the Report of the Working Group for 12th Plan (2012-17), the current demand of sillimanite is 32,000 tpy. Projected demand for next five years is 35,000 to 40,000 tpy at GDP growth rate of 8%, 9% and 10%. The production of sillimanite is likely to be increased in coming years to meet the demand. China will remain the leading market on global front.