

50 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 (cristobalite) on heating between 1350° and 1500° 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 (1810°C). After calcination of these minerals the mullite obtained has following properties: (1) Good high temperature insulator of electricity (2) Increase firing range and temperature (3) High mechanical strength (4) Low thermal expansion (5) Good resistance to thermal shock of cooling and heating (6) Good resistance to corrosion, and (7) It 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, saggars and laboratorywares.

RESOURCES

Kyanite

The total resources of kyanite as per UNFC system in the country as on 1.4.2005 are placed at 102.6 million tonnes. Out of these resources, only 1.4 million tonnes are the reserves and 101.2 million tonnes are the remaining resources. Out of total resources, high and medium-grade together are merely 1.3%, low grade 7.5%; mixed grade 0.8%, quartz kyanite gneiss and kyanite schist rock 89%, granular, others and not known grades 1.3 percent. 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 1.4.2005 are placed at 74 million tonnes. Out of these resources, the reserves are only 11 million tonnes, while about 63 million tonnes are the remaining resources. Out of total resources, more than 74% are granular high-grade, while quartz sillimanite rocks and sillimanite bearing rocks are about 20%. Resources of massive sillimanite of all grades are about 5%. The resources are located mainly in Orissa (26%), Tamil Nadu (24%), Uttar Pradesh (15%), Kerala and Andhra Pradesh (12% each) and Assam (6%). Remaining 5% resources are in Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Rajasthan and West Bengal (Table-2).

Andalusite

The total resources of andalusite as per UNFC system in the country as on 1.4.2005 are placed at 18 million tonnes. There are no reserves. The resources are of inferred category located in Uttar Pradesh and Jharkhand (Table-3).

EXPLORATION & DEVELOPMENT

In 2006-07 and 2007-08, DGM, Maharashtra carried out geological mapping and drilling for pyrophyllite and sillimanite in Walani-Khatgaon village, Chandrapur district. About 0.29 million tonnes of pyrophyllite/sillimanite resources were estimated in 2006-07 and 0.042 million tonnes in 2007-08 in the area. To find out the economic potentiality of kyanite and associated minerals, DMM, West Bengal carried out geological mapping and sampling in Inchadih - Gidighati-Patharbandh area in Purulia district during 2006-07 and 2007-08.

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**Table – 1 : Reserves/Resources of Kyanite as on 1.4.2005
(By States/Grades)**

Grade/State	Reserves				Remaining resources				Total resources (A+B)
	Proved STD111	Probable		Total (A)	Measured STD331	Indicated STD332	Inferred STD333	Total (B)	
		STD121	STD122						
All India : Total	921762	190216	262213	1374191	605209	3586402	95293321	101239031	102613222
By Grades									
High Grade	2700	-	20692	23392	-	297827	116689	420008	443400
Medium Grade	148660	16	98233	246909	-	34410	340678	624988	871897
Low Grade	127830	-	78342	206172	386247	2223900	3589727	7504352	7710524
High & Medium Mixed	-	100550	53103	153653	-	93640	106928	200568	354221
Medium & Low Mixed	-	-	-	-	-	-	48000	48000	48000
High, Medium & Low Mixed	13097	89650	5303	108050	-	45000	21099	260328	368378
Granular	-	-	-	-	-	167000	70000	237000	237000
Quartz Kyanite Rock	-	-	-	-	-	-	81105358	81105358	81105358
Kyanite Gneiss Rock	-	-	-	-	-	-	5370800	5370800	5370800
Kyanite Schist	-	-	-	-	-	724625	4250000	4974625	4974625
Others	-	-	-	-	-	-	12530	12530	12530
Not Known	629475	-	6540	636015	-	218962	261513	480475	1116490
By States									
Andhra Pradesh	-	-	399	399	-	-	80353829	80353829	80354228
Jharkhand	629475	190200	85458	905133	-	1754900	3048500	4803400	5708533
Karnataka	127830	16	94409	222255	-	386247	10682763	12679512	12901767
Kerala	-	-	-	-	-	218962	10000	228962	228962
Maharashtra	151360	-	76644	228004	4317	54000	1084034	2886831	3114835
Rajasthan	13097	-	5303	18400	-	-	-	5303	23703
Tamil Nadu	-	-	-	-	-	167000	87676	254676	254676
West Bengal	-	-	-	-	-	-	26520	26520	26520

Figures rounded off.

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**Table – 2 : Reserves/Resources of Sillimanite as on 1.4.2005
(By Grades/States)**

Grade/State	Reserves				Remaining resources				Total resources (A+B)			
	Proved		Probable		Measured		Indicated			Reconnaissance		
	STD111	STD121	STD122	Total (A)	STD221	STD222	STD331	STD332		STD333	Total (B)	
All India : Total	457305	10966689	11423994	4000	20097619	5358481	17630300	15975875	3849600	62915875	74339869	
By Grades												
Massive High Grade	-	-	-	-	-	-	-	11903	-	-	11903	11903
Massive Medium Grade	-	2880	2880	4000	-	-	-	34745	-	-	38745	41625
Massive Low Grade	6515	1536	8051	-	15283	-	850000	2258786	-	3124069	3132120	
Massive High & Medium	-	-	-	-	-	-	-	19800	-	-	19800	19800
Massive Medium & Low	144600	11290	155890	-	-	-	-	510	-	-	510	156400
Massive High, Medium & Low	-	-	-	-	-	-	-	38	-	-	38	38
Granular High	38401	10389153	10427554	-	20082336	3258481	7430300	13649577	-	44420694	54848248	
Quartz Sillimanite Rock	-	-	-	-	-	-	-	-	3748000	3748000	3748000	
Sillimanite Bearing Rock	-	-	-	-	-	2100000	9350000	-	-	-	11450000	
Unclassified	267789	557943	825732	-	-	-	-	-	-	-	825732	
Not Known	-	3887	3887	-	-	-	-	516	101600	102116	106003	
By States												
Andhra Pradesh	-	-	-	-	-	-	7430300	1346200	-	-	8776500	8776500
Assam	-	-	-	-	-	-	850000	6700	3748000	4604700	4604700	
Jharkhand	-	-	-	-	-	-	-	83000	-	-	83000	
Karnataka	-	-	-	-	-	-	-	982725	-	-	982725	
Kerala	-	2621240	2621240	-	-	3258481	-	3369200	-	6627681	9248921	
Madhya Pradesh	-	-	-	-	-	-	-	-	101600	101600	101600	
Maharashtra	150815	15534	166349	-	15000	-	-	6066	-	21066	187415	
Meghalaya	-	-	-	-	-	-	-	55807	-	55807	55807	
Orissa	-	7767913	7767913	-	6557013	-	-	4943600	-	11500613	19268526	
Rajasthan	300	236	536	-	283	-	-	-	-	283	819	
Tamil Nadu	306190	561766	867956	4000	13525323	-	-	3529577	-	17058900	17926856	
Uttar Pradesh	-	-	-	-	-	2100000	9350000	-	-	-	11450000	
West Bengal	-	-	-	-	-	-	-	1653000	-	1653000	1653000	

Figures rounded off.

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Table – 3 : Reserves / Resources of Andalusite as on 1.4.2005

(In '000 tonnes)

State	Total reserves	Remaining resources		Total resources (A+B)
	(A)	Inferred STD332	Total (B)	
All India : Total	-	18450	18450	18450
By States				
Jharkhand	-	4000	4000	4000
Uttar Pradesh	-	14450	14450	14450

Mine-head stocks at the end of 2007-08 were 1,781 tonnes as against 2,489 tonnes at the beginning of the year (Table -7).

The average daily employment of labour was 95 in 2007-08 as against 151 in the preceding year. Domestic prices of kyanite are furnished in Table-8.

PRODUCTION, STOCKS & PRICES

Kyanite

The production of kyanite at 4,804 tonnes in 2007-08, decreased by 40% as compared to the previous year due to lack of demand and closure of mines due to forest problem. There were 5 reporting mines during the year under review as against 7 mines in the previous year. The share of public sector was about 75% during 2007-08 as compared to 87% in the preceding year. More than 23% of the total production in 2007-08 was of grade above 40% Al₂O₃ and the rest 77% was of below 40% Al₂O₃ grade.

Jharkhand State Mining Corp.Ltd. alone accounted for about 75% of the total production during the year under review, followed by Maharashtra 25% (Tables - 4 to 6).

The Graphical Representation has been deleted

Table – 4 : Producers of Kyanite, 2007-08

Name & address of producer	Location of mine	
	State	District
Jharkhand State Mineral Development Corpn. Ltd. Khanij Nigam Bhawan, Nepal House Area, P.O. Doranda, Distt. Ranchi - 834 002. Jharkhand.	Jharkhand	Singhbhum (East)
H.M.Pavri, Salpekar Building, Rani Jhansi Square, P.O. Sitabuldi-440 012, Nagpur, Maharashtra.	Maharashtra	Bhandara
Pradeep Golchha, 3rd floor, Udyog Bhawan, Civil Lines, Nagpur.	Maharashtra	Bhandara

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**Table – 5 : Production of Kyanite, 2005-06 to 2007-08
(By States)**

(Qty in tones; value in Rs. '000)

State	2005-06		2006-07		2007-08(p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	8869	7141	8059	7584	4804	4696
Jharkhand	5227	5018	6750	6480	3624	3678
Karnataka	1588	508	144	79	-	-
Maharashtra	2054	1615	1165	1025	1180	1018

**Table – 6 : Production of Kyanite, 2006-07 and 2007-08
(By Sectors/States/Districts/Grades)**

(Qty in tones; value in Rs. '000)

State/District	No. of mines	2006-07				2007-08(p)				
		Quantity		Total	Value	Quantity		Total	Value	
		Above 40% Al ₂ O ₃	Below 40% Al ₂ O ₃			Above 40% Al ₂ O ₃	Below 40% Al ₂ O ₃			
		No. of mines	No. of mines			No. of mines	No. of mines			
India	7	1279	6780	8059	7584	5	1091	3713	4804	4696
Public sector	2	195	6780	6975	6678	1	-	3624	3624	3678
Private sector	5	1084	-	1084	906	4	1091	89	1180	1018
Jharkhand	1	-	6750	6750	6480	1	-	3624	3624	3678
Singhbhum (East)	1	-	6750	6750	6480	1	-	3624	3624	3678
Karnataka	1	144	-	144	79	-	-	-	-	-
Mysore	1	144	-	144	79	-	-	-	-	-
Maharashtra	5	1135	30	1165	1025	4	1091	89	1180	1018
Bhandara	5	1135	30	1165	1025	4	1091	89	1180	1018

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Table – 7 : Mine-head Stocks of Kyanite, 2007-08 (p)
(By States/Grades)

(In tonnes)

State	At the beginning of the year			At the end of the year		
	Above 40%	Below 40%	Total	Above 40%	Below 40%	Total
	Al ₂ O ₃	Al ₂ O ₃		Al ₂ O ₃	Al ₂ O ₃	
India	1133	1356	2489	160	1621	1781
Jharkhand	-	1327	1327	-	1327	1327
Karnataka	73	-	73	-	-	-
Maharashtra	1060	29	1089	160	294	454

Table – 8 : Prices of Kyanite, 2005-06 to 2007-08
(Domestic Markets)

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08 (p)
Raw Kyanite, Grade II	Ex-mine Doranda (Jharkhand)	960	960	1100
Graded Lumps (56% Al ₂ O ₃)	Ex-mine Girola/Sakra (Maharashtra)	2000	2000	2000
General Lumps (53% Al ₂ O ₃)	Ex-mine Girola/Sakra (Maharashtra)	2200	2200	2200
General Powder (53% Al ₂ O ₃)	Ex-mine Girola/Sakra (Maharashtra)	3200	3200	3200
Graded powder (56% Al ₂ O ₃)	Ex-mine Girola/Sakra (Maharashtra)	3500	3500	3500
Chilly	Ex-mine Girola/Sakra (Maharashtra)	600	600	600
Powder (53-55% Al ₂ O ₃)	Ex-mine Girola (Maharashtra)	3190	3190	3190
Lumps (50% Al ₂ O ₃)	Ex-mine Girola (Maharashtra)	1200	1200	1200
Off Grade	Ex-mine Nawargaon (Maharashtra)	250	250	250
Grade I (25-35% Al ₂ O ₃)	Ex-mine Bijenwas (Rajasthan)	300	300	300
Grade II (36-45% Al ₂ O ₃)	Ex-mine Bijenwas (Rajasthan)	400	400	400
50-52% Al ₂ O ₃	Ex-mine Kalyangiri (Karnataka)	500	500	500
30-45% Al ₂ O ₃	Ex-mine Kalyangiri (Karnataka)	300	300	300
Above 50% Al ₂ O ₃	Ex-mine Chamalapura (Karnataka)	650	650	650
35-42% Al ₂ O ₃	Ex-mine Chamalapura (Karnataka)	450	450	450

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Sillimanite

The production of sillimanite at 42,566 tonnes in 2007-08 registered an increase of 61% as compared to that in the previous year. There were 4 reporting mines in both the years. Besides, three mines reported production of sillimanite as an associated mineral with kyanite during the year.

Three principal producers contributed above 96% of the total production. Above 71% of total production of sillimanite was reported by the public sector, while the remaining 29% production was reported by the private sector. Maharashtra and Kerala the main producing states contributed as much as 34% to the total output in 2007-08 followed by Orissa 31%. Two private parties in Maharashtra reported 24% of production of sillimanite as an associated mineral with kyanite (Tables - 9 to 11).

Table – 9 : Producers of Sillimanite, 2007-08

Name & address of producer	Location of mine	
	State	District
Indian Rare Earths Ltd. 'Sherbanoo', 6 th floor, 111, Maharshi Karve Road, Mumbai-400 020, Maharashtra.	Orissa Kerala	Ganjam Kollam
* H. M. Pavri, Salpekar Building, Rani Jhansi Square, Nagpur-440 012, Maharashtra.	Maharashtra	Bhandara
Maharashtra State Mining Corp'n. Ltd. Udyog Bhavan, Civil Lines, Nagpur-440 001. Maharashtra.	Maharashtra	Bhandara

* Producing as an associated mineral with Kyanite.

Mine-head stocks at the end of the year were 4939 tonnes as against 3320 tonnes in the beginning of the year (Table -12).

The average daily employment of labour during 2007-08 was 1633 as against 1940 in the previous year. Domestic prices of sillimanite are furnished in Table - 13.

Andalusite

There was no production of andalusite in the country since 1988.

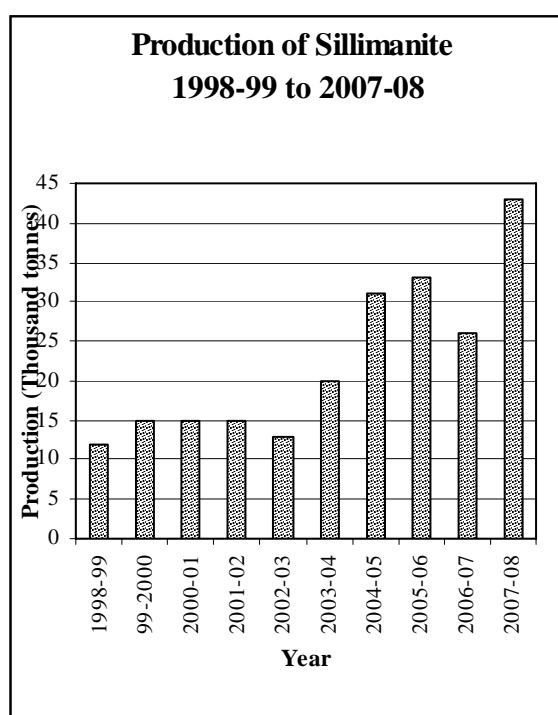


Table – 10 : Production of Sillimanite, 2005-06 to 2007-08 (By States)

(Qty. in tones; value in Rs.'000)

State	2005-06		2006-07		2007-08(p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	33119	174383	26366	101304	42566	179916
Kerala	10714	74998	5717	31152	14570	87420
Maharashtra	9198	9723	9481	9487	14637	12534
Orissa	13207	89662	11168	60665	13359	79962

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**Table – 11 : Production of Sillimanite, 2006-07 and 2007-08
(By Sectors/States/Districts)**

(Qty in tones; value in Rs. '000)

State/District	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	4(3)	26366	101304	4(3)	42566	179916
Public sector	4	20260	96603	4	30340	170371
Private sector	(3)	6106	4701	(3)	12226	9545
Kerala	1	5717	31152	1	14570	87420
Kollam	1	5717	31152	1	14570	87420
Maharashtra	2(3)	9481	9487	2(3)	14637	12534
Bhandara	2(3)	9481	9487	2(3)	14637	12534
Orissa	1	11168	60665	1	13359	79962
Ganjam	1	11168	60665	1	13359	79962

Figures in parentheses indicate the number of associated mines.

**Table – 12 : Mine-head Stocks of Sillimanite, 2007-08(p)
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
India	3320	4939
Kerala	19	555
Maharashtra	1020	3936
Orissa	2279	446
Rajasthan	2	2

**Table – 13 : Prices of Sillimanite, 2005-06 to 2007-08
(Domestic Markets)**

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08 (p)
'Q' Grade (bagged)	Ex-works Chavara (Kerala)	5883	5533	5533
OR Grade (Naked at Works)	Ex-works Chatrapur (Orissa)	6789	5827	5827
Grade I (Lumps)	Ex-mine Pohra (Maharashtra)	2400-3036	3050	3050
Grade II – A (Lumps)	Ex-mine Pohra (Maharashtra)	1400-1771	1780	1780
Grade II – B (Lumps)	Ex-mine Pohra (Maharashtra)	800-1012	1020	1020
Grade III	Ex-mine Pohra (Maharashtra)	475-604	610	610
Lumps	Ex-mine Pohra (Maharashtra)	400-506	610	610
Chilly Grade I	Ex-mine Pohra (Maharashtra)	1325-1677	1680	1680
Chilly Grade II	Ex-mine Pohra (Maharashtra)	660-835	835	835
Unsorted Chilly	Ex-mine Pohra (Maharashtra)	350-443	450	450
Sillimanite Rejects	Ex-mine Girola/Sakra (Maharashtra)	835	835	835
Graded Lumps 53% Al ₂ O ₃	Ex-mine Girola/Sakra (Maharashtra)	4750	4750	4750
Lumps, 50-53% Al ₂ O ₃	Ex-mine Girola (Maharashtra)	1200	1200	1200
Chilly, Below 43% Al ₂ O ₃	Ex-mine Girola (Maharashtra)	506	510	510

MINING & MARKETING

Kyanite

Kyanite mines are worked by opencast method. 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, Orissa and Tamil Nadu, as a by-product, along with ilmenite, rutile, zircon, garnet, etc. while recovering monazite. The Orissa Sands Complex of IREL in the coastal region of Chatrapur in Ganjam district, Orissa, has the capacity to recover 30,000 tpy granular sillimanite. At Chatrapur, mining is carried out by suction dredging with gravel pump. IREL's Chavara plant in Kollam district, Kerala, has an installed capacity of 7,080 tpy granular sillimanite, whereas that at Manavalakurichi in Tamil Nadu has a capacity of 1,500 tpy.

At Chavara in Kerala, beach sand mining operations are carried out 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.

SPECIFICATIONS

BIS has prescribed IS:14301-1995 (reaffirmed in 1999) 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 1999) in respect of beach sand sillimanite for use in refractory industry while IS:2045 in respect of natural sillimanite for refractory purpose has been withdrawn.

CONSUMPTION

Kyanite

Consumption of kyanite estimated at 16,600 tonnes in 2007-08 decreased by about 2% as compared to that in the previous year. Refractory industry accounted for 96% share. The remaining 4% was consumed in iron and steel industry.

Sillimanite

Consumption of sillimanite estimated at 11,900 tonnes in 2007-08 remained at the same level as in the previous year. Refractory industry alone accounted for more than 97% consumption (Table-14).

Table – 14 : Reported Consumption of Kyanite and Sillimanite 2005-06 to 2007-08 (By Industries)

	(In tonnes)		
Industry	2005-06	2006-07(R)	2007-08(p)
Kyanite			
All Industries	16700	16900	16600
Iron & steel	800(1)	1000(1)	700(1)
Refractory	15900(33)	15900(33)	15900(33)
Sillimanite			
All Industries	8800	11900	11900
Ceramic	100(3)	100(3)	100(3)
Chemical	200(1)	200(1)	200(1)
Foundry	++(1)	++(1)	++(1)
Refractory	8500(20)	11600(20)	11600(20)

Figures rounded off.

Data collected on non-statutory basis. Figures in parentheses denote the number of units in organised sector reporting consumption.

WORLD REVIEW

World reserve base of kyanite and related minerals is large in USA. South Africa reports reserve base of about 51 million tonnes of aluminosilicates (andalusite & sillimanite) as per Mineral Commodity Summaries, 2008. Andalusite is limited to only a few countries. The main producer of andalusite is South Africa. The main markets for andalusite are in Europe, South Africa and Asia and particularly in Japan. The USA and India are the main producers of kyanite. The principal market destination for kyanite is USA. Kyanite Mining Corp. in USA is, by far, the largest producer of kyanite, with an estimated production of about 90,000 tpy. India is also leading producer of sillimanite, World production of kyanite and related minerals is given in Table-15.

Table - 15 : World Production of Kyanite and Related Minerals (By Principal Countries)

(In tonnes)			
Country	2005	2006	2007
Australia			
Sillimanite	38	-	-
Brazil			
Kyanite ^(e)	200	200	200
France			
Andalusite ^(e)	65000	65000	65000
India@			
Kyanite	8869	8145	4645
Sillimanite	3349	26656	41453
South Africa			
Andalusite	228375	230000	230000
USA			
Kyanite*	90000	90000	90000

Source : World Mineral Production, 2003-2007.

** Including related minerals.*

@ During 2005-06, 2006-07 and 2007-08, India's production of kyanite was 8,869 tonnes, 8,059 tonnes and 4,804 tonnes, respectively, and that of sillimanite was 33,119 tonnes, 26,366 tonnes and 42,566 tonnes, respectively.

FOREIGN TRADE

Exports

In 2007-08, 2,471 tonnes of kyanite was exported mainly to Malaysia and Indonesia. Exports of sillimanite increased to 1,445 tonnes in 2007-08 from 328 tonnes in the previous year. Exports of andalusite in 2007-08 also increased to 88 tonnes from 21 tonnes in the previous year. Sillimanite was exported mainly to Japan, Iran, China and Bangladesh while andalusite was exported to Japan in 2007-08 (Tables - 16 to 18).

Imports

In 2007-08, imports of kyanite increased to 210 tonnes as against 54 tonnes in the previous year. Imports of sillimanite also increased marginally to 37 tonnes in 2007-08 from 35 tonnes in the previous year. Imports of andalusite increased to 5,925 tonnes in 2007-08 from 4,120 tonnes in the previous year. In 2007-08, kyanite was imported from USA and Nepal. China and Bulgaria were main suppliers of sillimanite while South Africa was main supplier of andalusite (98%) (Tables - 19 to 21).

Table - 16 : Exports of Kyanite (By Countries)

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	-	-	2471	17410
Malaysia	-	-	1960	9629
Indonesia	-	-	511	7781

KYANITE, SILLIMANITE AND ANDALUSITE

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

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	328	3177	1445	9630
Japan	40	650	581	3824
China	135	884	270	2132
Iran	24	718	324	2122
Thailand	-	-	57	741
Bangladesh	-	-	120	313
Malaysia	-	-	28	157
Nepal	-	-	17	140
UAE	36	324	28	128
Kenya	9	131	-	-
Sri Lanka	84	462	-	-
Other Countries	++	++	20	73

**Table – 18 : Exports of Andalusite
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	21	326	88	1263
Japan	-	-	88	1263
Thailand	21	326	-	-

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

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	54	1798	210	3800
USA	40	600	200	2671
Nepal	14	1198	10	1129

KYANITE, SILLIMANITE AND ANDALUSITE

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

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	35	1140	37	1129
Bulgaria	15	773	13	897
China	-	-	22	183
Nepal	++	6	1	33
Germany	++	18	1	16
Indonesia	20	331	-	-
Sweden	++	12	-	-

**Table – 21 : Imports of Andalusite
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	4120	67189	5925	91306
South Africa	4051	65983	5794	88876
France	24	546	70	1432
Nepal	27	383	4	194
Germany	-	-	++	20
USA	18	277	-	-
Unspecified	-	-	57	784

FUTURE OUTLOOK

The reserves of kyanite and sillimanite in India are very limited. As per National Steel Policy, 2005, the future demand of steel by 2019-20 is placed at 110 million tonnes. Indian Steel Industry is likely to grow fast and there is likely to be a considerable increase in demand of refractories in future. There

is therefore a need to develop domestic resources to support this growth by increased prospecting, exploration and beneficiation of low grade kyanite and sillimanite bearing rocks and attracting new investments in mining. MSMC is having plans to set up one plant for manufacturing mullite aggregate from low-grade sillimanite.