50 Kyanite, Sillimanite and Andalusite

Kyanite, sillimanite and andalusite are three aluminium silicate minerals having the same chemical composition ($Al_2O_3.SiO_2$) 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 ($3Al_2O_3.2SiO_2$) and vitreous silica (cristobalite) on heating between 1350^0 and 1500^0 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 (1810^0C). 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 1.4.2005 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% and granular, others and not-known grades 1.3%. 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 74.3 million tonnes. Out of these resources, the reserves are only 11.4 million tonnes, while about 62.9 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 Odisha (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 reserves/resources of andalusite as per UNFC system in the country as on 1.4.2010 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

In 2009-10, DGM, Maharashtra carried out geological mapping and drilling for pyrophyllite and sillimanite in Walni-Khatgaon village, Chandrapur district. About 1.29 million tonnes of pyrophyllite/sillimanite resources were estimated in the area. The exploration was also carried out by Directorate of Geology, Odisha. Details of exploration are furnished in Table-4.

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

(In tonnes)

Grade/State	Reserves				Remaining resources						Total resources (A+B)
	Proved STD111	Probable		Total (A)	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Total (B)	
		STD121	STD122		STD221	STD222					
All India : Total	**921762**	**190216**	**262213**	**1374191**	**4317**	**1749782**	**605209**	**3586402**	**95293321**	**101239031**	**102613222**
By Grades											
High Grade	2700	-	20692	23392	4317	1175	-	297827	116689	420008	443400
Medium Grade	148660	16	98233	246909	-	249900	-	34410	340678	624988	871897
Low Grade	127830	-	78342	206172	-	1304478	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	-	194229	-	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	1610502	10682763	12679512	12901767
Kerala	-	-	-	-	-	-	218962	-	10000	228962	228962
Maharashtra	151360	-	76644	228004	4317	1744480	-	54000	1084034	2886831	3114835
Rajasthan	13097	-	5303	18400	-	5303	-	-	-	5303	23703
Tamil Nadu	-	-	-	-	-	-	-	167000	87676	254676	254676
West Bengal	-	-	-	-	-	-	-	-	26520	26520	26520

Figures rounded off.

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

(In tonnes)

Grade/State	Reserves				Remaining resources						Total resources (A+B)
	Proved STD111	Probable		Total (A)	Pre-feasibility		Measured STD331	Indicated STD332	Reconnaissance STD333	Total (B)	
		STD121	STD122		STD221	STD222					
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	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	83000
Karnataka	-	-	-	-	-	-	-	982725	-	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
Odisha	-	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	11450000
West Bengal	-	-	-	-	-	-	-	1653000	-	1653000	1653000

Figures rounded off.

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

(In '000 tonnes)

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

Table – 4 : Details of Exploration Activities For Kyanite, Sillimanite and Andalusite, 2009-10

Agency/ State/ District	Location	Mapping		Drilling		Sampling	Remarks and reserves/Resourcese estimated
		Area (sq km)	Scale	No. of borehole	Meterage		
DG, Odisha							
Odisha Puri	3-6 km NE of Puri Town	5.2	1:2000	253 (Auger Drill)	2013	–	Mapping carried out relates to geomorphological & land use / land cover. Exploration carried out for heavy minerals like ilmenite, rutile, garnet, sillimanite, zircon. Resources were not estimated.
-do-	Nabha NE sector along Puri Cost	1.9	1:2000	416 (Auger Drill)	3328	–	Exploration carried out for heavy minerals like ilmenite, rutile, garnet, sillimanite, zircon. Resources were not estimated.
-do-	SW of Konark aroung Tikina Village	7.95	1:2000	402 (Auger Drill)	3045	–	Exploration carried out for heavy minerals like ilmenite, rutile, garnet,sillimanite, zircon. Resources were not estimated.
DGM, Maharashtra Chandrapur	Walni-Khatgaon	40	–	–	535.50	Chemical samples all pyrophyllite core samples	Presence of pyrophylite-silliminite rock has been noticed in the area. About 1.29 million tonnes of resources of pyrophyllite-silliminite were estimated.

PRODUCTION, STOCKS & PRICES

Kyanite

The production of kyanite at 5,553 tonnes in 2009-10, increased by 20% as compared to the previous year due to demand. There were 4 reporting mines during the year under review as against 5 mines in the previous year. The share of public sector was about 84% during 2009-10 as compared to 78% in the preceding year.

In 2009-10 more than 17% of the total production of kyanite was of grade above 40% Al_2O_3 and the rest 83% was of below 40% Al_2O_3 grade.

Jharkhand State Mining Corp. Ltd alone accounted for about 80% of the total production during the year under review. Remaining 20% was the contribution of one public sector mine and two private sector mines in Maharashtra (Tables-5 to 7).

Mine-head stocks at the end of 2009-10 were 2,401 tonnes as against 2,998 tonnes at the beginning of the year (Table - 8).

The average daily employment of labour was 99 in 2009-10 as against 125 in the preceding year. Prices of kyanite are furnished in the General Review on Prices.

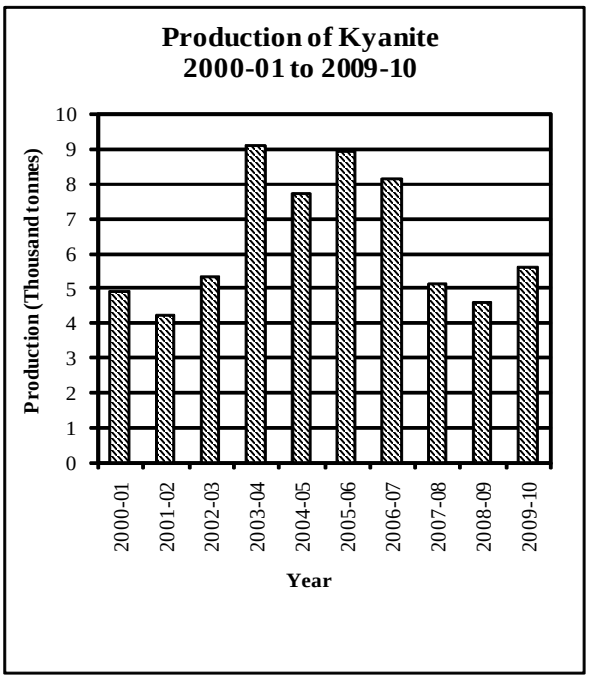

Table – 5 : Producers of Kyanite, 2009-10

Name & address of producer	Location of mine	
	State	District
Jharkhand State Mineral Development Corpn. Ltd, Khanij Nigam Bhawan, Nepal House Area, P.O. Doranda, Ranchi - 834 002, Jharkhand.	Jharkhand	Singhbhum (East)
H.M.Pavri, Salpekar Building, Rani Jhansi Square, P.O. Sitabuldi - 440 012, Nagpur, Maharashtra.	Maharashtra	Bhandara
Maharashtra State Mining Corporation Ltd, Plot No. 7, Ajni Chowk, wardha Road, Nagpur - 440 015, Maharashtra.	Maharashtra	Bhandara

Table – 6 : Production of Kyanite, 2007-08 to 2009-10
(By States)

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

State	2007-08		2008-09		2009-10 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	**5102**	**5393**	**4620**	**5184**	**5553**	**6417**
Jharkhand	3624	4135	3615	4407	4419	5443
Maharashtra	1478	1258	1005	777	1134	974

Table – 7 : Production of Kyanite, 2008-09 and 2009-10
(By Sectors/States/Districts/Grades)

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

State/District	2008-09					2009-10 (P)				
	No. of mines	Quantity		Total	Value	No. of mines	Quantity		Total	Value
		Above 40% Al_2O_3	Below 40% Al_2O_3				Above 40% Al_2O_3	Below 40% Al_2O_3		
India	**5**	**786**	**3834**	**4620**	**5184**	**4**	**948**	**4605**	**5553**	**6417**
Public sector	1	–	3615	3615	4407	2	149	4543	4692	5642
Private sector	4	786	219	1005	777	2	799	62	861	775
Jharkhand	**1**	**–**	**3615**	**3615**	**4407**	**1**	**–**	**4419**	**4419**	**5443**
Singhbhum (East)	1	–	3615	3615	4407	1	–	4419	4419	5443
Maharashtra	**4**	**786**	**219**	**1005**	**777**	**3**	**948**	**186**	**1134**	**974**
Bhandara	4	786	219	1005	777	3	948	186	1134	974

Table – 8 : Mine-head Stocks of Kyanite, 2009-10 (P)
(By States/Grades)

(In tonnes)

State	At the beginning of the year			At the end of the year		
	Above 40% Al_2O_3	Below 40% Al_2O_3	Total	Above 40% Al_2O_3	Below 40% Al_2O_3	Total
India	**562**	**2436**	**2998**	**406**	**1995**	**2401**
Jharkhand	–	1326	1326	–	1326	1326
Maharashtra	562	1110	1672	406	669	1075

Sillimanite

The production of sillimanite at 30,690 tonnes in 2009-10 decreased by 9% as compared to that in the previous year due to lack of demand and capacity expansion project activities. There were 4 reporting mines in both the years. Besides, two mines reported production of sillimanite as an associated mineral with kyanite during the year.

Three principal producers contributed the entire production. Above 74% production of sillimanite was reported by the public sector, while the remaining 26% production was reported by the private sector. Odisha, the main producing state contributed as much as 46% of the total output of sillimanite in 2009-10 followed by Maharashtra (28%) and Kerala (26%) (Tables - 9 to 11).

Mine-head stocks at the end of the year 2009-10 were 334 tonnes as against 2,634 tonnes at the beginning of the year (Table - 12).

The average daily employment of labour during 2009-10 was 1,720 as against 2,050 in the previous year. Domestic prices of sillimanite are furnished in the General Review on Prices.

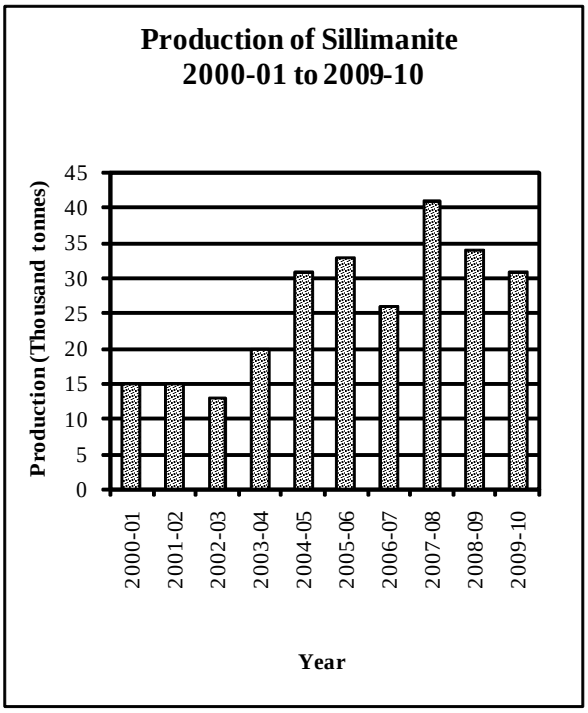

Table – 9 : Producers of Sillimanite, 2009-10

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 Kerala	Ganjam Kollam
* H. M. Pavri, Salpekar Building, Rani Jhansi Square, Nagpur - 440 012, Maharashtra.	Maharashtra	Bhandara
Maharashtra State Mining Corpn. Ltd, Udyog Bhavan, Civil Lines, Nagpur - 440 001. Maharashtra.	Maharashtra	Bhandara

**Producing as an associated mineral with kyanite.*

Table – 10 : Production of Sillimanite, 2007-08 to 2009-10 (By States)

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

State	2007-08		2008-09		2009-10 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	**40537**	**176725**	**33702**	**236871**	**30690**	**254990**
Krala	14571	87426	10423	91504	7933	84370
Maharashtra	12198	8638	9130	7628	8640	6438
Odisha	13358	79360	13878	136879	14117	164182
Tamil Nadu	410	1301	271	860	–	–

Table – 11 : Production of Sillimanite, 2008-09 and 2009-10 (By Sectors/States/Districts)

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

State/District	2008-09			2009-10 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	**4(4)**	**33702**	**236871**	**4(2)**	**30690**	**254990**
Public sector	4(1)	25717	231070	4	22784	249456
Private sector	(3)	7985	5801	(2)	7906	5534
Kerala	**1**	**10423**	**91504**	**1**	**7933**	**84370**
Kollam	1	10423	91504	1	7933	84370
Maharashtra	**2(3)**	**9130**	**7628**	**2(2)**	**8640**	**6438**
Bhandara	2(3)	9130	7628	(2)	8640	6438
Odisha	**1**	**13878**	**136879**	**1**	**14117**	**164182**
Ganjam	1	13878	136879	1	14117	164182
Tamil Nadu	**(1)**	**271**	**860**	–	–	–
Kanyakumari	(1)	271	860	–	–	–

Figures in parentheses indicate the number of associated mines.

Table – 12 : Mine-head Stocks of Sillimanite 2009-10(P) (By States)

(In tonnes)

State	At the beginning of the year	At the end of the year
India	**2634**	334
Kerala	130	57
Maharashtra	947	229
Odisha	1552	48
Tamil Nadu	5	–

Andalusite

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

MINING & MARKETING

Kyanite

Kyanite mines are worked by opencast method. Generally, the mineral is marketed under three grades: above 60% Al_2O_3, 50-60% Al_2O_3 and less than 50% Al_2O_3. 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.

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 Al_2O_3 58% min for Grade-1 and 54% min for Grade-2; Fe_2O_3 1.50% max, K_2O + Na_2O 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

Reported consumption of kyanite estimated at 8400 tonnes in 2009-10 decreased by about 5% as compared to that in the previous year. Refractory industry accounted for 92% share. The remaining 8% was consumed in iron and steel industry.

Sillimanite

Reported consumption of sillimanite estimated at 13,800 tonnes in 2009-10 increased marginally over the previous year. Refractory industry alone accounted for about 96% consumption (Table-13).

Table – 13 : Reported Consumption of Kyanite and Sillimanite 2007-08 to 2009-10 (By Industries)

(In tonnes)

Industry	2007-08	2008-09	2009-2010(P)
Kyanite			
All Industries	**8000**	**8800**	**8400**
Iron & steel	700(1)	700(1)	700(1)
Refractory	7300(22)	8100(23)	7700(23)
Sillimanite			
All Industries	**12600**	**13700**	**13800**
Ceramic	200(4)	300(4)	400(4)
Chemical	200(1)	200(1)	200(1)
Foundry	++(1)	++(1)	++(1)
Refractory	12200(21)	13200(23)	13200(26)

Figures rounded off.
Data collected on non-statutory basis. 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 of andalusite is South Africa. The USA and India are the main producers of kyanite. Kyanite Mining Corpn. in USA is, by far, the largest producer of kyanite, with an estimated production of about 80,000 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)

(In tonnes)

Country	2007	2008	2009
Brazil			
Kyanite[e]	200	200	200
France			
Andalusite[(e)]	65000	65000	65000
India			
Kyanite	5102	4351	5414
Sillimanite	40537	33721	29774
South Africa			
Andalusite[(e)]	230000	245000	245000
USA			
Kyanite*	118000	115000	80000[e]

***Source:** World Mineral Production, 2005-2009.*
** Including related minerals.*

FOREIGN TRADE

Exports

In 2009-10, 130 tonnes of kynite was exported mainly to Sudan, Japan and Nepal. Exports of sillimanite increased to 6,708 tonnes in 2009-10 from 2,013 tonnes in the previous year. Sillimanite was exported mainly to Malaysia.

There were no exports of andalusite during 2009-10 (Tables - 15 to 17).

Imports

In 2009-10, imports of kyanite were 292 tonnes as against 200 tonnes in the previous year. Imports of sillimanite decreased to 1,148 tonnes in 2009-10 from 2,745 tonnes in the previous year. Imports of andalusite also decreased to 5,930 tonnes in 2009-10 from 8,267 tonnes in the previous year. USA was the main supplier of kyanite and Ukrain was main supplier of sillimanite while South Africa was the main supplier of andalusite in 2009-10(Tables - 18 to 20).

Table – 15 : Exports of Kyanite (By Countries)

Country	2008-09		2009-10	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	**219**	**1149**	**130**	**2315**
Sudan	–	–	89	1782
Japan	–	–	21	413
Nepal	18	49	20	120
Bangladesh	150	226	–	–
Mauritius	51	874	–	–

Table – 16 : Exports of Sillimanite (By Countries)

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	**2013**	**11798**	**6708**	**21409**
Malaysia	–	–	6000	11162
Iran	288	2578	119	4139
Japan	206	3616	122	2463
China	191	2340	135	2127
Bangladesh	862	1919	200	620
Singapore	61	213	100	456
Thailand	144	859	24	412
Nepal	31	92	8	16
UAE	–	–	++	12
Maldives	230	181	–	–
Other countries	–	–	++	2

Table – 17 : Exports of Andalusite (By Countries)

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	**++**	**2**	**–**	**–**
Nepal	++	2	–	–

Table – 18 : Imports of Kyanite (By Countries)

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	**200**	**4457**	**292**	**8171**
USA	179	3228	279	5143
Nepal	21	1229	13	3028

Table – 19 : Imports of Sillimanite (By Countries)

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	**2745**	**36142**	**1148**	**12589**
Ukrain	1	32	1122	11757
Nepal	–	–	6	490
USA	2608	31289	20	341
Germany	10	2095	–	–
Unspecified	126	2726	–	–
Other countries	–	–	++	1

Table – 20 : Imports of Andalusite (By Countries)

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	**8267**	**165807**	**5930**	**127949**
South Africa	7120	142527	5559	119417
France	545	12871	371	8531
China	576	10164	–	–
Nepal	26	244	–	–
Other countries	++	1	++	1

FUTURE OUTLOOK

The reserves of kyanite and sillimanite in India are very limited. 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.