

49 Kaolin, Ball Clay, Other Clays and Shale

1. Kaolin (China Clay)

Kaolin, also known as china clay, is a natural clay formed by weathering of felspars. It is relatively pure clay predominantly consisting of kaolinite ($\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$), associated with other clay minerals like dickite, halloysite, nacrite and anauxite. Kaolin is commercially valued for its whiteness and fine particle size which distinguish it from other clays, such as, ball clay and fireclay. Other physical characteristics that influence commercial utility include brightness, glossiness, abrasiveness and viscosity. It often contains small amounts of impurities in the form of rock fragments, hydrous oxides and colloidal materials. Kaolin is produced and consumed in the country in crude & processed forms. The major use of crude china clay in the country is in cement industry and of processed china clay is in ceramic industry. India has extensive deposits of china clay distributed almost in every state and is in a reasonable position to cater to the needs of both domestic and export markets.

RESOURCES

China clay resources in the country as per UNFC system as on 1.4.2005 have been placed at 2,595.66 million tonnes, of which the reserves are only about 8% of the resources at 222 million tonnes. Out of the total reserves, 46% (about 102 million tonnes) reserves are under proved category whereas 54% (about 120 million tonnes) reserves fall under probable category.

The resources are spread over in a number of states of which Kerala holds about 24%, followed by West Bengal (16%), Rajasthan (14%), Orissa (11%) and Karnataka (10%).

Out of total resources, about 22% or 579 million tonnes fall under ceramic/pottery grade,

4% are classified under chemical, paper filler and cement grades and about 74% or 1,922 million tonnes resources fall under mixed grade, others, unclassified & not-known categories. The details of reserves/resources are given in Table - 1.

EXPLORATION & DEVELOPMENT

Details of exploration carried out by different exploration agencies during 2006-07 and 2007-08 are given in Table-2.

PRODUCTION, STOCKS & PRICES

The production of kaolin at 1.29 million tonnes in 2007-08 decreased by 12% as compared to previous year mainly due to low market demand.

There were 87 reporting mines during 2007-08 as against 104 mines in the previous year. Besides, the production of kaolin was also reported as an associated mineral from one mine.

Twenty five principal producers accounted for about 89% of the total output of kaolin in 2007-08. There were 80 private sector mines reported 92% of the total production and the remaining 8% by 7 public sector mines. During 2007-08, thirty two mines each producing more than 10,000 tonnes annually accounted for 87% of the total production of kaolin (natural) while 13 mines, each in the production range of 5000 to 10000 tonnes annually accounted for 7% and the remaining 9 percent of the production of kaolin (natural) was shared by 42 small mines, each producing up to 5000 tonnes annually. The contribution of natural and processed kaolin in 2007-08 was 80% and 20% respectively as against 81% and 19% in the preceding year.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table - 1 : Reserves/Resources of China Clay as on 1.4.2005
(By Grades/States)**

Grade/State	Reserves						Remaining resources						Total resources (A+B)
	Proved STD111	Probable		Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)		
		STD121	STD122		STD221	STD222							
All India : Total	101520	13142	107459	222121	3214	29460	34819	408009	1588599	22005	2373540	2595661	
By Grades													
Chemical	-	-	-	-	-	600	-	-	33945	-	34545	34545	
Ceramic/Pottery	25472	4618	37752	67842	1256	19688	13696	20487	334479	19812	511324	579166	
Mixed grade	22661	566	41248	64476	-	1393	1924	600	159031	-	163159	227635	
Filler	9263	3500	8732	21495	-	50	333	303	33786	-	34484	55979	
Cement	1077	-	397	1475	-	364	843	-	552	-	1759	3234	
Others	9419	1777	6726	17923	606	6465	11257	776	44226	429	243828	261751	
Unclassified	30283	1237	2819	34339	1352	286	1769	986	27592	1259	36483	70822	
Not known	3343	1443	9785	14572	-	613	4996	1998	954988	505	1347957	1362529	
By States													
Andhra Pradesh	4490	2578	4841	11908	-	-	-	5	179	-	61582	73675	
Assam	-	131	-	131	-	3360	-	392	-	-	160	4043	
Bihar	-	-	-	-	-	-	-	104	1296	-	1438	1438	
Chhattisgarh	914	179	1585	2678	-	600	110	-	11378	-	12088	14766	
Delhi	19	-	60	79	-	-	-	857	3723	-	5210	5289	
Goa	-	-	-	-	-	-	16	-	-	-	16	16	
Gujarat	38581	924	27685	67190	-	148	867	3088	38917	3	43958	111148	
Haryana	-	7	29	36	2367	782	3348	13	5485	-	12029	12065	
Jammu & Kashmir	-	-	-	-	-	-	-	-	28122	-	28122	28122	
Jharkhand	22162	711	7774	30647	-	1383	28	2007	7280	42	159493	190140	
Karnataka	1805	3714	2168	7687	241	311	1997	220360	443	26017	249369	257056	
Kerala	7826	1055	670	9551	-	303	2077	43930	534582	19770	621101	630652	
Madhya Pradesh	943	-	443	1386	-	-	17	-	11741	-	11774	13161	
Maharashtra	418	-	354	772	-	256	502	11	184	-	6477	7248	
Manipur	-	-	-	-	-	-	-	2520	-	-	2520	2520	
Meghalaya	-	-	-	-	-	-	-	1890	5786	-	88875	88875	
Orissa	557	1523	37293	39373	-	-	23	76	201907	1259	238789	278162	
Puducherry	-	-	-	-	-	-	-	-	2940	-	2940	2940	
Rajasthan	23050	1858	17384	42292	606	22317	25328	545	279266	340	329418	371710	
Tamil Nadu	-	-	-	-	-	-	-	-	56570	-	56897	56897	
Uttar Pradesh	-	-	-	-	-	-	-	11600	3447	-	25065	25065	
West Bengal	757	461	7173	8390	-	-	300	36	331935	591	412281	420671	

Figures rounded off.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Table – 2 : Details of Exploration Activities for Kaolin and other clays during 2006-07 and 2007-08

Year/ Agency/ State/ District	Location	Mapping		Drilling		Sampling	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage (m)		
2006-07							
GSI							
Rajasthan							
Clay Nagaur & Pali	Junjala-Padeli- Khera Narnolia area	-	-	-	-	-	On the basis of borehole data for lignite exploration and examination of dug well cuttings a potential clay zone has been established.
DMG							
Kerala							
Kasaragod	Paivalike Paivalike village	-	-	10	155.5	18	Estimated 14 million tonnes of china clay resources.
-do-	Kommangal Padavu, Paivalika Orkadi village	-	-	5	212	-	Estimated 4 million tonnes of china clay resources.
-do -	Erikkulam, Madikai village,	-	-	3	80.5	-	Estimated 24 million tonnes of china clay resources.
-do -	Moonu road Malpacheri area	-	-	4	93	-	Estimated 2.5 million tonnes of china clay resources.
Thiruvanan- thapuram	Bishop Thoppu area Veiloor village	-	-	3	90	-	Estimated 0.3 million tonnes of china clay resources.
Kollam	Kadayattu area Mulavana village	1:1000	0.1725	5	154.5	32	Estimated 0.09 million tonnes of china clay resources.
-do-	Kanjivakode area Mulavana village	1:1000	0.0025	3	81	11	Estimated 0.045 million tonnes of china clay resources.
Rajasthan							
Bhilwara	N/v Jitiya,- Bhawanipura, Chidtiriyas, Kolandia	-	4.5	-	-	-	Low grade china clay bed of width varying from 30 m to 60 m recorded for a strike length of 1000 m.
Nagaur	N/V Indavar Luniyas	1:50,000	100	-	-	5	Clay occurrences noted in wells N/v Phalki, Bargaon, Basni, etc.
2007-08							
DMG							
Rajasthan							
Barmer	N/v Bhadka, Akli, Nimla, Nimsar, etc.	1:50,000 1:10,000 1:2,000	350 15 3	-	-	5	Up to 10.5 m thick white clay bed seen to occur in Tanka pits, Nala-river cutting N/v Nimla, Agoria, Nimsar, etc.
Dausa	N/v Haldina and Nangal Charan	1:10,000	4	-	-	-	White/grey clay pocket was marked in 80 x 3 m area and 22,800 tonnes of reserves were estimated.
Nagaur	N/v Indawar, Lunias, etc.	1:50,000	300	-	-	-	Observed 2 to 6 m thick clay bed in wells at Lunias, Badgaon.
DMM							
West Bengal							
Birbhum	Makdum nagar	-	-	-	-	-	Four pits dug out and occurrences of china clay recorded.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Gujarat was the leading producing State of kaolin accounting for 38% of the total production in 2007-08, followed by Kerala 30%, Rajasthan 16%, West Bengal 6% and Andhra Pradesh 2%. The remaining 8% was shared by Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra and Orissa. About 98% of the total production of kaolin (processed) was contributed by Kerala, Jharkhand, Gujarat and West Bengal in 2007-08. Remaining 2% of Kaolin (Processed) is contributed by Orissa and Karnataka (Tables 3 to 7).

Mine-head stocks of kaolin at the end of 2007-08 were 300 thousand tonnes as against 332 thousand tonnes in the beginning of the year (Table - 8).

The average daily employment of labour during 2007-08 was 2,391 as against 2,927 in the preceding year. Domestic prices of kaoline during 2005-06 to 2007-08 are furnished in Table - 9.

Table – 3 : Principal Producers of Kaolin, 2007-08

Name & address of producer	Location of mine	
	State	District
Shri Ram Mine Chem International Madhapur-370 020, Dist. Kachchh, Gujarat.	Gujarat	Kachchh
English Indian Clays Ltd. KP 111/428, Veli. P. O. Thiruvananthapuram, Dist. Thiruvananthapuram, Kerala.	Kerala	Thiruvananthapuram
Shankarlal Gangaram Thakkar P. O. Santhalpur-385 850, Dist. Banaskantha, Gujarat.	Gujarat	Patan Kachchh
The Kerala Ceramics Ltd. P. Box No. 2, P. O. Kundra-691 501, Dist. Kollam, Kerala.	Kerala	Kollam

(Contd.)

Table - 3 (Contd.)

Name & address of producer	Location of mine	
	State	District
Mohd. Sherkhan Pathan P. O. Sawa-312613, Dist. Chittorgarh, Rajasthan.	Rajasthan	Chittorgarh
Patel Nagar Minerals & Industries Pvt. Ltd. P. O. Md. Bazar-731 132, Dist. Birbhum, West Bengal.	West Bengal	Birbhum
Manoj P. Solanki At - Madhapar, P. O. Bhuj, Dist. Kachchh, Gujarat	Gujarat	Kachchh
Smt. Suhura Beevi Thiruvananthapuram, Kerala.	Kerala	Thiruvananthapuram
Sureshchandra Oza F-13, 14 Ricco Indl. Area, P.O. Piplund, Dist. Bhilwara, Rajasthan.	Rajasthan	Bhilwara
Speciality Mineral (P) Ltd. 307/308 Arundeeep Complex, Baroda-390 105, Gujarat.	Gujarat	Kachchh
Modi Levigated Kaolin Co. P. O. Neem-ka-Thana-332 713, Dist. Sikar, Rajasthan.	Rajasthan	Jaipur
S. N. Dua D. B. H. International (I) Ltd. N-75, Connaught Place, New Delhi.	Kerala	Thiruvananthapuram
Bharat Minerals 5/1, Clive Rd. Kolkata, West Bengal.	West Bengal	Kolkata
The Singhbhoom Minerals Co. P. O. Chaibasa-833 201, Dist. West Singhbhum, Jharkhand.	Jharkhand	Singhbhum

(Contd.)

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Table - 3 (Contd.)

Name & address of producer	Location of mine	
	State	District
J. K. White Cement Works P. O. Gotan-342 902, Dist. Chittorgarh, Rajasthan.	Rajasthan	Chittorgarh
Wolkem Industries Ltd. Lake House, P. P. Singhal Marg, Udaipur-313 504, Rajasthan.	Kerala	Thiruvananthapuram
H. D. Enterprises Pvt. Ltd. Silver Point H. D. House, P.O. Bhuj-370 001, Dist. Kachchh, Gujarat.	Gujarat	Kachchh
J. S. Jobanputra P. O. Santalpur, Dist. Patan, Gujarat.	Gujarat	Kachchh
G. V. Thakkar P.O. Santalpur-385 350, Dist. Patan, Gujarat.	Gujarat	Kachchh Patan
Kerala Clays & Ceramics (P) Ltd. (Govt. of Kerala Entp), P.O. Pappinisseri-670 561, Dist. Kannur, Kerala.	Kerala	Kannur Kasargod

(Contd.)

Table - 3 (Concl.)

Name & address of producer	Location of mine	
	State	District
Deedwania & Sons D-4, Nagori Garden, P. O. Bhilwara, Dist. Bhilwara, Rajasthan.	Rajasthan	Bhilwara
M. A. Nazar 8-A, Kowadiyar Manor, Jawahar Nagar, Dist. Thiruvananthapuram, Kerala.	Kerala	Thiruvananthapuram
D. M. Minerals (P) Ltd. 114/1, Baripara Lane, Kolkata-700 056, West Bengal.	Jharkhand	Singbhum
Amrapali & Company 19/20/21, Narayana Chambers, Ashram Road, Ahmedabad Gujarat.	Gujarat	Mehasana
Rajmahal Quartz Sand & Kaolin Co. 1, Netaji Subhash Chandra Rd; Kolkata, West Bengal.	Jharkhand	Sahebganj

**Table - 4 : Production of Kaolin, 2005-06 to 2007-08
(By States)**

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

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	1335744	2053626	1460363	1622193	1291724	1547852
Andhra Pradesh	29628	2042	109852	8850	21541	2611
Chhattisgarh	1405	166	2729	360	1706	233
Gujarat	417188	80233	526064	97702	485837	97751
Jharkhand	118931	61527	88654	64938	91013	78434
Karnataka	12166	12435	12647	9709	3750	5055
Kerala	474594	1865307	429208	1376845	390642	1297892
Madhya Pradesh	16835	1578	14854	1384	10250	923
Maharashtra	380	48	372	22	-	-
Orissa	4431	1949	2874	1599	2506	1314
Rajasthan	178936	22851	186943	24227	206325	25423
West Bengal	81250	35490	86166	36527	78154	38216

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Table – 5 : Production of Kaolin, 2006-07 and 2007-08
(By Sectors/States/Districts/Grades)

State/ District	(Qty. in tonnes, Value in Rs. '000)													
	2006-07					2007-08 (p)								
	No. of mines	Natural Qty	Natural Value	Processed Qty	Processed Value	Total Qty	Total Value	No. of mines	Natural Qty	Natural Value	Processed Qty	Processed Value	Total Qty	Total Value
India	104(3)	1187101	204952	273262	1417241	1460363	1622193	87(1)	1027280	187908	264444	1359944	1291724	1547852
Public sector	7	5906	1325	45783	139143	51689	140468	7	61024	8233	44560	172754	105584	180987
Private sector	97(3)	1181195	203627	227479	1278098	1408674	1481725	80(1)	966256	179674	219884	1187191	1186140	1366865
Andhra Pradesh	12	109852	8850	-	-	109852	8850	8	21541	2611	-	-	21541	2611
Adilabad	3	8276	652	-	-	8276	652	2	11780	1093	-	-	11780	1093
Cuddapah	3	66846	5684	-	-	66846	5684	1	2901	435	-	-	2901	435
East Godavari	4	5410	1082	-	-	5410	1082	3	4960	992	-	-	4960	992
Visakhapatnam	2	29320	1432	-	-	29320	1432	2	1900	91	-	-	1900	91
Chhattisgarh	3	2729	360	-	-	2729	360	2	1706	233	-	-	1706	233
Rajnandgaon	3	2729	360	-	-	2729	360	2	1706	233	-	-	1706	233
Gujarat	32	495930	64142	30134	33560	526064	97702	30	460347	70470	25490	27281	485837	97751
Kachchh	17	255399	39899	-	-	255399	39899	17	332348	57278	-	-	332348	57278
Mahesana	2	-	-	6230	6542	6230	6542	2	-	-	8270	8684	8270	8684
Patan	5	225825	22583	-	-	225825	22583	5	106062	10606	-	-	106062	10606
Sabarkantha	8	14706	1660	23904	27018	38610	28678	6	21937	2586	17220	18597	39157	21183
Jharkhand	9(1)	60390	19808	28264	45130	88654	64938	8(1)	59763	21935	31250	56499	91013	78434
Ranchi	1	3062	214	-	-	3062	214	1	370	26	-	-	370	26
Sahebganj	3(1)	9091	465	13819	29003	22910	29468	2(1)	2880	403	16221	34263	19101	34666
Singhbhum (West)	5	48237	19129	14445	16127	62682	35256	5	56513	21506	15029	22236	71542	43742

(Contd.)

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Table - 5 : (Concl.d.)

State/ District	2006-07						2007-08 (p)									
	No. of mines		Natural		Processed		Total		No. of mines		Natural		Processed		Total	
	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value
Karnataka	3	3672	1023	8975	8686	12647	9709	2	150	15	3600	5040	3750	5055	3600	5040
Hassan	1	3050	961	5385	6866	8435	7827	1	-	-	3600	5040	3600	5040	-	-
Kolar	1	-	-	2550	676	2550	676	-	-	-	-	-	-	-	-	-
Shimoga	1	622	62	1040	1144	1662	1206	1	150	15	-	-	150	15	-	-
Kerala	19	230838	54835	198370	1322010	429208	1376844	13	197149	38256	193493	1259637	390642	1297893	17021	35188
Kannur	2	-	-	19434	39081	19434	39081	2	-	-	17021	35188	17021	35188	-	-
Kasargod	2	-	-	2831	7055	2831	7055	1	-	-	965	1930	965	1930	-	-
Kollam	2	12534	3392	15142	85552	27676	88944	2	73344	11959	19434	126419	92778	138378	-	-
Thiruvananthapuram	13	218304	51443	160963	119322	379267	1241765	8	123805	26297	156073	7096100	279878	1122397	-	-
Madhya Pradesh	6(2)	14854	1384	-	-	14854	1384	3	10250	923	-	-	10250	923	-	-
Jabalpur	1	3047	305	-	-	3047	305	-	-	-	-	-	-	-	-	-
Katni	2	10400	938	-	-	10400	938	1	10250	923	-	-	10250	923	-	-
Satna	4(1)	1407	141	-	-	1407	141	2*	-	-	-	-	-	-	-	-
Maharashtra	1	372	22	-	-	372	22	-	-	-	-	-	-	-	-	-
Nagpur	1	372	22	-	-	372	22	-	-	-	-	-	-	-	-	-
Orissa	3	1017	271	1857	1328	2874	1599	3	1066	198	1440	1116	2506	1314	1440	1116
Bargarh	1	500	90	-	-	500	90	1	1032	186	-	-	1032	186	-	-
Mayurbhanj	2	517	181	1857	1328	2374	1509	2	34	12	1440	1116	1474	1128	-	-
Rajasthan	11	186943	24227	-	-	186943	24227	14	206325	25423	-	-	206325	25423	-	-
Bhilwara	3	29695	3083	-	-	29695	3083	5	56994	6040	-	-	56994	6040	-	-
Bundi	1	639	64	-	-	639	64	1	1041	104	-	-	1041	104	-	-
Chittorgarh	2	126249	15767	-	-	126249	15767	5	117210	13840	-	-	117210	13840	-	-
Jaipur	2	30360	5313	-	-	30360	5313	2	31080	5439	-	-	31080	5439	-	-
Sikar	-	-	-	-	-	-	-	1#	-	-	-	-	-	-	-	-
West Bengal	5	80504	30030	5662	6527	86166	36557	4	68983	27844	9171	10371	78154	38215	9171	10371
Birbhum	5	80504	30030	5662	6527	86166	36557	4	68983	27844	9171	10371	78154	38215	9171	10371

Figures in parentheses indicate the number of associated mines

* Mines reporting for Bauxite & Ochre

Mines reporting for Dolomite.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table – 6 : Production of Kaolin (Natural), 2006-07 & 2007-08(p)
(By Frequency Groups)**

(In tonnes)

Production Group	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
All Groups	85(2)	69	1187101	1027280	100.0	100.0	-	-
Up to 500	10(1)	8	2696	1835	0.2	0.2	0.2	0.2
501-1000	8	1	5779	720	0.5	0.8	0.7	0.3
1001-2000	8	6	12445	7554	1.1	0.7	1.8	1.0
2001-3000	10	8	25085	20297	2.1	2.0	3.9	3.9
3001-4000	5(1)	8	15848	28616	1.3	2.8	5.2	5.8
4001-5000	5	-	22575	-	1.9	-	7.1	5.8
5001-10000	12	11	83051	79047	7.0	7.7	14.1	13.5
10001-15000	5	11	57568	138768	4.9	13.5	19.0	27.0
15001 & above	22	16	962054	750443	81.0	73.0	100.0	100.0

Figures in parentheses indicate the number of associated mines.

**Table – 7 : Production of Kaolin (Processed), 2006-07 & 2007-08(p)
(By Frequency Groups)**

(In tonnes)

Production Group	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
All Groups	27(1)	21(1)	273262	264444	100.0	100.0	-	-
Up to 500	1	-	402	-	0.2	-	0.2	-
501-1000	3	5	2250	3980	0.8	1.5	1.0	1.5
1001-2000	7	1	10238	1440	3.7	0.5	4.7	2.0
2001-3000	2	1	4740	2220	1.7	0.8	6.4	2.8
3001-4000	1	3	3737	11055	1.4	4.2	7.8	7.0
4001-5000	4	-	16964	-	6.2	-	14.0	7.0
5001-10000	5(1)	6(1)	35981	36414	13.2	13.8	27.2	20.8
10001-15000	2	3	22845	33828	8.4	12.8	35.6	33.6
15001 & above	2	2	176105	175507	64.4	66.4	100.0	100.0

Figures in parentheses indicate the number of associated mines.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Table - 8 : Mine-head Stocks of Kaolin, 2007-08 (p)
(By States)

(In tonnes)

State	At the beginning of the year	At the end of the year
India	331595	299612
Andhra Pradesh	58689	47714
Chhattisgarh	2138	2126
Gujarat	3124	42569
Jharkhand	28456	19503
Karnataka	8568	5582
Kerala	41999	28370
Madhya Pradesh	17342	34605
Maharashtra	30	-
Orissa	2362	1654
Rajasthan	103221	99404
West Bengal	37538	18085

Table - 9 : Prices of Kaolin, 2005-06 to 2007-08
(Domestic Markets)

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08 (p)
Grey clay/white clay +65% recovery	Ex-mine Sulaikha (Andhra Pradesh)	450-475	450-500	475-525
Pink clay +65% recovery	Ex-mine Sulaikha ((Andhra Pradesh)	200-250	250-300	300-350
Inferior grade clay	Ex-mine Sulaikha ((Andhra Pradesh)	150-200	200-250	200-250
Chinaclay (bluefil waste)	Ex-mine Kundara (Kerala)	135	135	135
China clay powder	Ex-mine Kundara (Kerala)	1500	2000	2000
Natural dried kaolin	Ex-mine Kundara (Kerala)	5000	5500	5500
Kaolex paper coating grade	Ex-mine Kundara (Kerala)	6500	6700	6700
Foot ware grade	Ex-mine Kundara (Kerala)	6500	6700	6700
Detergent grade	Ex-mine Kundara (Kerala)	5000	5600	5600
Agri clay	Ex-mine Kundara (Kerala)	500	500	500
Grade I	Ex-mine Neem-Ka-Thana (Rajasthan)	2800-3100	2850-3600	3900-4400
Grade II	Ex-mine Neem-Ka-Thana (Rajasthan)	2500-2750	2500-2800	3050-3500
Grade III	Ex-mine Neem-Ka-Thana (Rajasthan)	1000-1500	1000-2000	1000-2000
China clay	Ex-mine Santalpur (Gujarat)	250	250	250
White clay	Ex-mine Santalpur (Gujarat)	250	250	250

MINING, PROCESSING & MARKETING

China clay deposits worked in India are mostly of pocket-type. Opencast manual mining is followed in most kaolin mines. The most common practice is to dig trial pits for locating clay pockets or beds which are gradually enlarged into pits of various dimensions. China clay is often soft and easily extracted with no blasting required. Clay

and overburden are quarried in benches. In few mines, bulldozers and excavators are used to remove the overburden which is then transported through trucks/tractors/trailers.

Crude china clay is normally processed outside the leasehold area. Almost all the china clay user industries except cement, insecticide and refractory units consume processed china clay. The natural china clay is being processed in the

country mostly by the conventional method of levigation/washing. In addition, hi-tech processes, such as, Mozeley hydrocyclone separator, high-intensity magnetic separator, bleaching (chemical decolourisation), spray drying and calcination are in practice. There is a need to use more sophisticated processing techniques like ultra froth-flotation, cryo-filter, etc.

The recovery percentage of processed china clay from raw china clay ranges from as low as 14% to as high as 56%, depending upon the quality of china clay in different states. Large number of levigation plants are installed in the country mostly in Kerala, Gujarat, Jharkhand, West Bengal and Rajasthan. The important plants amongst them are English India Clays Ltd (EICL), Veli, Thiruvananthapuram, Kerala; Kerala Clays and Ceramic Products Ltd Payangadi, Kannur district, Kerala; 20 Microns Ltd Mamuara, Bhuj district, Gujarat; Amrapalli China Clay Washing Plant, Nadapa, Bhuj district, Gujarat; Mokdumnagar China Clay Processing Plant of West Bengal Projects Ltd Mohammad Bazar, Birbhum district, West Bengal and Hindalco's Beneficiation Plant at Bagru Plateau in Lohardaga district, Jharkhand. Wolkem India Ltd is understood to have acquired a kaolin deposit with an initial 20,000 tpy clay processing facility. The capacity is to further expand to 40,000 tpy in the future. EICL has capacity to produce 150,000 tpy paper coating and filler grades of processed china clay, besides 20,000 tpy of calcined clays. It is in the process of increasing capacity of calcined clay to 60,000 tpy. Ashapura is on the verge of establishing new production unit in Kerala with a 200,000 tpy kaolin capacity of various grades-air floated, lumps, hydrous and hydrous calcined.

Processed kaolin is being marketed under various trade names mostly in levigated and spray dried forms. A small quantity of crude kaolin is also marketed. The various trade names under which the levigated kaolin is marketed are Hibrite,

Cerefel - K.C.G. Spray dried, K.C.G. Lumps, B.C.K. Spray dried, etc. Grading is based primarily on white colouration and grit content. Improved processing techniques could further the prospects of Indian kaolin in the international markets.

USES AND SPECIFICATIONS

China clay (kaolin) is used in a number of industries in both crude and processed forms. The major use for crude china clay in India is in cement industry whereas ceramic industry accounts for a major share of processed form of china clay. Besides ceramics, processed china clay finds use in other industries in the country, such as sealants, paper coatings, as extender in fibre glass, paint and as a filler for paper, rubber, plastic, cosmetics, pharmaceuticals and textiles. Crude china clay also finds use in insecticide and refractory industries. Other uses of china clay are in ink, ultramarine, synthetic zeolite, catalyst, water filter candles, soaps & detergents and explosives & pyrotechnic industries.

The Bureau of Indian Standards (BIS) has prescribed specifications for china clay to be used in different industries. They are IS:505-1995 (Third Revision; Reaffirmed 1999) for paper coating and filler for paper, rubber, textile industries, IS:68-1979 (First Revision, Reaffirmed 2002) for paint, IS:1463-1983 (Third Revision, Reaffirmed 2000) for cosmetics and IS:7589-1974 (Reaffirmed 1998) for explosive & pyrotechnic industry. BIS has revised the specifications for china clay for ceramic industry to IS:2840 - 2002 (Second Revision). The whiteness, particle size, plasticity, contents of alumina, iron and titanium are some important factors which control the specifications of china clay for different end uses. China clay for ceramic and refractory applications is analysed for grit, brightness, green and dry strength, fixed colour, iron and alumina contents. For filler and extender applications, it must meet very rigid specifications, such as, particle size, colour, brightness and viscosity (Table - 10).

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Table – 10 : Specifications of China Clay Required in Different Industries

Sl. No.	Characteristics	Paper coating Grade I	Filler in paper, rubber, textile Grade II	Paint Grades I & II	Cosmetics	Explosives
1.	Bureau of Indian Standard Specification No.	505 (1995)	505 (1995)	68 (1979)	1463 (1983)	7589 (1974)
2.	Fineness (by weight % material retained on:)					
	45 micron sieve	-	-	0.5 (Gr. II)	2.0	-
	53 micron sieve	0.8	1.0	-	-	-
	63 micron sieve	-	-	0.5 (Gr.I)	-	1.0
	90 micron sieve	-	-	-	0.1	-
3.	Larger than 10 microns in diameter (% by mass, max.)	5.0	15.0	-	-	-
4.	Smaller than 10 microns in diameter (% by mass, min.)	75.0	60.0	-	-	-
5.	Grit (% by mass, max.)	-	-	-	-	0.001
6.	Loss on drying (% max.)	2.0	2.0	2.0	1.5	1.5
7.	Loss on ignition (% max.)	14-15.5	14-15.5	10-14	15	14.0
8.	Water Plasticity (%)	14.0	-	-	-	-
9.	Shrinkage linear					
	a) Dry shrinking	-	-	-	-	-
	b) Fired shrinking	-	-	-	-	-
10.	Relative/Bulk density	2.5-2.9	2.5-2.9	-	* 0.65-0.90(BD)	
11.	Colour reflectance to blue light (%)	80-85	*	-	-	-
12.	Chemical (% by mass, max.)	-	-	-	@	-
	Fe ₂ O ₃	0.6	0.75	-	0.5	-
	Matter soluble in HCl	0.5-1	1.5-2.5	-	2.0	1.5
	CuO	-	0.007	-	-	-
	MnO	-	0.013	-	-	-
	Heavy metals (as Pb)	-	-	-	5 ppm	-
	As ₂ O ₃	-	10 ppm	-	2 ppm	-
	pH value of aqueous extract	4.5-7.5	4.5-7.5	6-8.5	7.5	6.0-7.5
13.	Oil absorption (ml/100 gm)	-	50 (min)	25-40±10	-	35-45
14.	Water soluble matter (% , max.)	-	0.5	1.0	-	0.5

* As agreed.

@ To pass test for iron and carbonate as well.

CONSUMPTION

The main consuming industry for raw china clay is the china clay processing/refining plants. The china clay processed by these plants in turn is consumed by various industries except cement, refractories and pesticides industries. The data on raw china clay consumption by various china clay processing plants are not readily available. However, the consumption of china clay by various industries is given in Table-11.

Consumption of china clay decreased to 838,400 tonnes in 2007-08, from 879,600 tonnes in 2006-07. Ceramic industry accounted for 64% consumption followed by cement (29%), the major consumer of raw china clay. Pesticide, paint, refractory, paper, cosmetic, rubber, abrasive, asbestos products, chemical, dry cell batteries, electrical, electrode and glass industries together accounted for about remaining 7%.

**Table - 11 : Reported Consumption of Kaolin*
(China clay), 2005-06 to 2007-08
(By Industries)**

Industry	(In tonnes)		
	2005-06 (R)	2006-07	2007-08(p)
All Industries	875700	879600	838400
Cement ^{1/}	238400 (9)	243400 (9)	245600 (9)
Ceramic*	535500(236)	534800(236)	537400 (236)
Cosmetic	2200 (3)	2200 (5)	2200 (5)
Glass	2300 (3)	2300 (3)	2300 (3)
Paint	23700(23)	23700(23)	23700 (23)
Paper	20200(20)	20200(20)	20200 (20)
Pesticide	25200(20)	25200(20)	25200 (20)
Refractory	23600(25)	23200(26)	23200 (26)
Rubber	3000(30)	3000(30)	3000 (30)
Others (abrasive, asbestos-products, chemicals, dry cell battery, electrical, electrode and textile).	1600(39)	1600(39)	1600 (39)

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

^{1/} Pertains to raw/unprocessed china clay.

* Includes 2 units which processed crude china clay to the tune of 58,400 tonnes, each during 2005-06, 2006-07 and 2007-08, for supply of refined/processed china clay to ceramic industry.

TRADE POLICY

As per the Foreign Trade Policy (FTP) 2004-2009, there are no restrictions in exports and imports of china clay (kaolin).

WORLD REVIEW

Occurrences of kaolin are widespread in the world. Kaolin is mined, processed and traded by most of the countries. The world resources of kaolin are very large. Alternatively, improved processing technologies are facilitating usage of hitherto unuseable china clay deposits which are today abundantly exploited and are made suitable for various consuming industries. No foreseeable crunch in meeting the world demand is envisaged.

The world production of kaolin at 25.5 million tonnes in 2007 showed slight increase over that in the previous year. Four countries, namely, USA, China, Brazil, and UK accounted for about 58% world production. The share of USA in total world production was about 29%, followed by China (13%), Brazil (10%), UK (7%) (Table-12.)

**Table - 12 : World Production of Kaolin
(By Principal Countries)**

Country	(In '000 tonnes)		
	2005	2006	2007
World : Total	25500	25400	25500
Brazil	2410	2455	2527
China	3120	3270	3300 ^(e)
Czech Republic	649	673	682
France	319	300 ^(e)	307
Germany ^(e)	750	750	750
Iran	531	803	NA
Korea, Rep. of	1075	959	1054
Malaysia	495	341	588
Mexico	877	962	971
Spain	463	476	475
Turkey	615	600 ^(e)	600 ^(e)
UK	1911	1762	1671
USA	7800	7470	7330 ^(e)
Vietnam	780	800 ^(e)	800 ^(e)
Other countries	3705	3779	4445

Source : World Mineral Production, 2003-2007.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

About fifty countries are known to produce kaolin ranging from relatively low cost unprocessed common clays to processed grades of kaolin. The production of refined kaolin is concentrated in countries, namely, USA, Brazil, UK and China that account for more than half the world kaolin production. Almost half the refined kaolin (about 13 million tonnes per annum) produced in the USA, UK and Brazil enters in world trade. The world demand for kaolin used for coating purposes is around 8 million tonnes per year, mainly North America (31%), Europe (35%), Asia (9%), Japan (15%) and others (11%). Coating kaolin production capacity is now 10 million tonnes per year.

Brazil

Exploration for kaolin in the Amazon basin, particularly in the vicinity of the Jari and Capim rivers has been conducted over the past many years. There are two operating mines and 15 under-developed deposits (13 controlled by CVRD and two by CPRM) in the Capim River Basin. The mines exploit high-quality sedimentary seams of kaolin. RCC has completed expansion to 1 million tpy capacity taking the Brazilian kaolin processing capacity to 3.2 million tpy. Imerys, as the world's largest kaolin producer now controls Imerys Rio Capim Caulim SA (RCC).

China

Grey clays associated with coal measures in northern China have often low iron titanium. They yield a high quality, high brightness, calcined product suitable for paper and speciality markets.

In Huaibei, Anhui Province, the Golden Rock Kaolin Co. Ltd is mining clay in underground and stock piled at the surface, the current capacity is 20,000 tpy and mainly exported for use in paper and paint.

UK

In UK majority of deposits in Cornwall and Devon, now controlled by Imerys (A French group). The Goonvean, a privately owned company is the only other producer with a capacity of 2,50,000 tpy. Goonvean has developed a product called Diamond Star for use in high

quality tableware and procelain, which has low iron and titanium, which gives rise to good-fired whiteness and translucency in tableware (in both oxidative and reductive firing conditions). In Cornwall, mining of kaolin has been done by wet process, traditionally. However, some dry mining from the Dorothy, Great Longstones and Lower Longstones pits is being carried out and gives a better quality control for selected products. Dry mining now accounts for 45% of the total kaolin mined.

FOREIGN TRADE

Exports

Exports of kaolin decreased to 59,457 tonnes in 2007-08 from 70,233 tonnes in 2006-07. Bangladesh (36%) and UAE (28%) were the major importing countries in 2007-08 (Table - 13).

Imports

Imports of kaolin increased to 43,550 tonnes in 2007-08 from 29,806 tonnes in 2006-07. Major suppliers were USA (38%), Indonesia (21%), China (14%) and Brazil (13%) (Table - 14).

**Table - 13 : Exports of Kaolin
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	70233	339547	59457	299605
UAE	30236	126216	16704	65614
Bangladesh	24886	79308	21388	58479
Egypt	646	10011	2032	27862
Thailand	1386	19159	2087	21724
Sri Lanka	2311	20161	2770	21114
Angola	-	-	2500	17126
Jordan	857	5235	1887	12007
Mauritius	1016	8873	1054	8243
Indonesia	643	10140	501	6317
Italy	640	8921	287	5110
Other countries	7612	51523	8247	56009

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table - 14 : Imports of Kaolin
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	29806	393054	43550	460541
USA	16694	227172	16688	188184
China	4443	52566	6122	74563
Indonesia	-	-	8945	59895
Brazil	3873	41548	5698	54545
UK	1147	20623	1515	23701
Czech Republic	439	3820	1262	9548
New Zealand	147	3854	380	9226
Australia	378	7639	351	7239
Spain	377	6155	526	7235
France	842	10391	443	5489
Other countries	1466	19286	1620	20916

FUTURE OUTLOOK

India has abundant resources of kaolin which can easily meet both the internal and the external demands. The future requirement of processed kaolin in the domestic market is expected to grow substantially. The processing of kaolin in the country is done mostly by conventional methods like levigation and washing. Hi-tech processing techniques may have to be adopted for generation of processed kaolin in future.

New capacities for processing have to be established and existing capacities have to be augmented in the country to meet the increased requirement of processed kaolin in the future.

Efforts to foray into the potential markets like Egypt, Zimbabwe, Iran, Malaysia, Jordan and Pakistan need to be prioritised, besides increasing the exports to the traditional and neighbouring markets like Bangladesh, Sri Lanka and Nepal as also other prospective markets such as, Kenya, UAE, Saudi Arabia and Bahrain.

2. Ball Clay

Ball clay and china clay are used for similar purposes in ceramic and pottery. Ball clay and china clay differ only in the degree of plasticity. China clay is less plastic than ball clay. Ball clay is a highly plastic variety of kaolin having high binding power, tensile strength and shrinkage. It is utilised generally after mixing with non-plastic clay to impart the desired plasticity in pottery, porcelain and refractory materials. It also helps in the preparation of glaze, enamels and for imparting a dense vitrified body.

RESOURCES

The total resources of ball clay as on 1.4.2005 in the country are placed at 79.29 million tonnes. Out of these resources, the reserves are about 32.53 million tonnes and the remaining resources are 46.76 million tonnes. More than 63% resources are in Andhra Pradesh, followed by Rajasthan 36%. Resources in Gujarat are nominal. Out of the total resources, ceramic/pottery grade constitutes 89%. All India reserves/resources of ball clay are given in Table-15.

**Table - 15 : Reserves/Resources of Ball Clay as on 1.4.2005
(By Grades/States)**

Grade/State	(In tonnes)										
	Reserves				Remaining resources					Total resources (A+B)	
	Proved STD111	Probable		Total A	Feasibility STD211	Pre-feasibility		Indicated STD332	Inferred STD333		Total B
	STD121	STD122			STD221	STD222					
All India : Total	14786626	3062777	14680390	32529793	112700	1610220	1398102	2279330	41361051	46761403	79291196
By Grades											
Ceramic/pottery	11927848	3019993	13609068	28556909	112700	1564086	1330782	2279330	36700129	41987027	70543936
Others	-	-	-	-	-	46134	67320	-	107800	221254	221254
Unclassified	2858778	42784	1071322	3972884	-	-	-	-	4553122	4553122	8526006
By States											
Andhra Pradesh	6677726	2806267	10746533	20230526	-	-	-	2279330	27647424	29926754	50157280
Gujarat	-	103560	146250	249810	-	-	-	-	49670	49670	299480
Rajasthan	8108900	152950	3787607	12049457	112700	1610220	1398102	-	13663957	16784979	28834436

Figures rounded off.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

PRODUCTION, STOCKS & PRICES

The production of ball clay at 641 thousand tonnes in 2007-08 increased by 2% as compared to that in the previous year owing to market demand.

There were 33 reporting mines during 2007-08 as against 31 in the previous year. Six principal producers accounted for above 73% of total production. The share of public sector mines in the total production was 13 % and the balance 87% production was reported from the private sector.

Rajasthan occupied the leading position contributing 63% of the total production during the year, while Andhra Pradesh was second with 36%. The remaining one percent of production was the contribution of Tamil Nadu and Gujarat (Tables - 16 to 18).

Mine-head stocks of ball clay at the end of the year 2007-08 were 230 thousand tonnes as against 401 thousand tonnes at the beginning of the year (Table - 19).

The average daily employment of labour in 2007-08 was 317 as against 276 in the previous year. Domestic prices of ball clay are furnished in Table - 20.

Table – 16 : Principal Producers of Ball clay 2007-08

Name & address of producer	Location of mine	
	State	District
Harish Clays, Prem Prakash, S.M.S. Highway, Jaipur-302 003, Rajasthan.	Rajasthan	Bikaner
Vijayabharti Corporation, Congress Office Road, P. O. Eluru, Ditt. West Godavari, Andhra Pradesh.	Andhra Pradesh	West Godavari
Tahlaram & Sons, Rathkhana Colony, Bikaner-334 001, Rajasthan.	Rajasthan	Bikaner
Andhra Pradesh Mineral Dev., Corp. Ltd House No.8-3-945, Ameerrpet Pancom Business Center Hyderabad-500 016.	Andhra Pradesh	West Godavari
Jaichandlal Daga Bagree Mohalla Bikaner-334 001, Rajasthan	Rajasthan	Bikaner
Anirudh Mines and Minerals Near Ramdev Park, out side Nathusar Gate, Bikaner-334 004 Rajasthan.	Rajasthan	Bikaner

Table - 17 : Production of Ball Clay, 2005-06 to 2007-08 (By States)

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

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	406675	49315	626801	138652	640869	145656
Andhra Pradesh	196391	18148	251320	63731	229463	70909
Gujarat	4785	718	30	4	25	3
Rajasthan	198593	29413	368451	73335	402935	72835
Tamil Nadu	6906	1036	7000	1582	8446	1909

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table - 18 : Production of Ball clay, 2006-07 and 2007-08
(By Sectors/States/Districts)**

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

State/District	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	31(1)	626801	138652	33	640869	145656
Public sector	2	104366	5866	2	84503	4571
Private sector	29(1)	522435	132786	31	556366	141085
Andhra Pradesh	13(1)	251320	63731	11	229463	70909
East Godavari	1	18800	2914	1	17385	2682
West Godavari	12(1)	232520	60817	10	212078	68227
Gujarat	1	30	4	2	25	3
Kachchh	1	30	4	1	15	2
Patan	0	0	0	1	10	1
Rajasthan	16	368451	73335	19	402935	72835
Bikaner	16	368451	73335	19	402935	72835
Tamil Nadu	1	7000	1582	1	8446	1909
Cuddalore	1	7000	1582	1	8446	1909

* Associated with kaolin.

**Table - 19 : Mine-head Stocks of Ball Clay, 2007-08 (p)
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
India	401033	230368
Andhra Pradesh	107723	104005
Gujarat	499	489
Rajasthan	290776	125145
Tamil Nadu	2035	729

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table - 20 : Prices of Ball Clay, 2005-06 to 2007-08
(Domestic Markets)**

		(In Rs. per tonne)		
Grade	Market	2005-06	2006-07	2007-08 (p)
Sp. grade	Ex-mine Dwaraka Turamala (Andhra Pradesh)	-	1200-1500	1200-1600
Select grade	Ex-mine Dwaraka Turamala (Andhra Pradesh)	550	550	600
Grade I	Ex-mine Dwaraka Turamala (Andhra Pradesh)	150	150	160
Grade II	Ex-mine Dwaraka Turamala (Andhra Pradesh)	42	42	42
Double dressed	Ex-mine Srikolayatji (Rajasthan)	1200	1800	2000
1st grade	Ex-mine Srikolayatji (Rajasthan)	1000	1100	1200
r.o.m. grade	Ex-mine Srikolayatji (Rajasthan)	400	550	800
C & D grade	Ex-mine Srikolayatji (Rajasthan)	100	195	300
Super grade	Ex-mine Bikaner (Rajasthan)	450	550	550
Grade A	Ex-mine Bikaner (Rajasthan)	240	290	290
Grade C	Ex-mine Bikaner (Rajasthan)	65	90	90

SPECIFICATIONS

The specifications for plastic clay and washed plastic clay for use in ceramic industry are prescribed vide IS:4589 - 2002 (Third Revision).

CONSUMPTION

Consumption of ball clay decreased from 468,700 tonnes in 2006-07 to 332,300 tonnes in 2007-08. About 98% consumption was accounted for by ceramic industry. The remaining consumption was reported by the refractory and abrasive industries (Table - 21).

FOREIGN TRADE

Exports

Exports of ball clay increased to 12,546 tonnes in 2007-08 from 10,572 tonnes in 2006-07. Exports were mainly to Bangladesh (Table- 22).

Imports

Imports of ball clay increased substantially in 2007-08 to 1,66,340 tonnes from 77,014 tonnes in the previous year. Imports were mainly from Ukraine 89% and UK 9% (Table - 23).

**Table - 21: Consumption of Ball clay, 2005-06 to 2007-08
(By Industries)**

		(In tonnes)		
Industry	2005-06 (R)	2006-07	2007-08 (p)	
All Industries	461600	468700	460000	
Abrasive	100 (2)	100 (2)	100 (2)	
Ceramic	450900 (224)	458000 (222)	449300(222)	
Refractory	106000 (21)	10600 (23)	10600 (23)	

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

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table - 22 : Exports of Ball Clay
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	10572	36162	12456	40459
Bangladesh	10320	35074	10968	35042
Djibouti	-	-	200	1481
Sri Lanka	-	-	416	1130
China	-	-	400	1097
UAE	190	932	220	954
Nepal	-	-	127	365
Trinidad	-	-	16	171
Kenya	54	108	81	160
Hong Kong	8	48	26	28
Saudi Arabia	-	-	2	28
Other countries	++	++	++	3

**Table – 23 : Imports of Ball Clay
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	77014	423548	166340	740262
Ukraine	60791	247660	147285	574462
UK	14043	155493	14216	133625
USA	359	4489	689	7479
Japan	140	2550	380	6259
Thailand	671	4427	357	2472
Germany	118	1995	142	2382
China	751	5054	305	2124
France	118	1569	76	902
Belgium	-	-	40	571
Unspecified	-	-	2800	9808
Other countries	23	311	50	178

3. Clay (Others)

Clay under this category includes aluminous, ferruginous, tile & brick-making clays.

PRODUCTION & STOCKS

The production of clay(others) at 803 thousand tonnes in 2007-08 decreased by about 34% compared to that in the preceding year due to less demand.

There were 13 mines reporting production in 2007-08 as against 18 mines in the previous year. About 40% of total production of clay(others) was reported from 9 mines as an associated mineral. Entire production of clay(others) was in private sector.

Gujarat, the major producing State, accounted for about 45% of the total production during 2007-08 followed by Madhya Pradesh 30%, Andhra Pradesh 19% and Karnataka 6%. Nominal

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

amount of production was also reported from West Bengal.

About 92% of the production was contributed by four principal producers. Among them, two principal producers having four associated mines, each reporting more than 67 thousand tonnes annually contributed 54% of the production (Tables - 24 to 27).

Mine-head stocks of clay(others) was 30 thousand tonnes at the end of 2007-08 as against 24 thousand tonnes at the beginning of the year (Table-28).

The average daily employment of labour was 112 during 2007-08 as against 155 in the previous year. Domestic prices of clay (others) are furnished in Table -29.

Table - 24 : Principal Producers of Clay (Others), 2007-08

Name & address of producer	Location of mine	
	State	District
Sanghi Industries Ltd P. O. Bermoti, Ta I: Abdasa, Dist. Kachchh-370 655, Gujarat.	Gujarat	Kachchh
**The ACC Ltd 'Cement House', 121, Maharshi Karve Road, Mumbai - 400 020, Maharashtra.	Madhya Pradesh	Katni
**G. N Vijay Post : Veldurthy, Taluqa: Dhone, Dist. Kurnool, Andhra Pradesh	Andhra Pradesh	Kurnool
** Madras Cements Ltd P. O. Kumaraswamy Rajanagar, Taluqa : Jaggayyapet, Dist. Krishna-521 457, Andhra Pradesh.	Andhra Pradesh	Krishna

** Producing as an associated mineral.

**Table - 25 : Production of Clay (Others), 2005-06 to 2007-08
(By States)**

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

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	805765	36006	1224235	105245	802621	63169
Andhra Pradesh	186483	16030	245017	34612	150941	16501
Chhattisgarh	-	-	1077	135	160	40
Gujarat	498253	13841	534667	15696	364389	10799
Karnataka	8500	595	-	-	45000	4500
Madhya Pradesh	112281	5525	443000	54778	242035	31321
West Bengal	248	15	474	24	96	8

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Table – 26 : Production of Clay (Others), 2006-07 and 2007-08 (p)
(By Sector/States/Districts)

(Qty. in tonnes; value in 000)

State/District	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	18(7)	1224235	105245	13(9)	802621	63169
Private sector	18(7)	1224235	105245	13(9)	802621	63169
Andhra Pradesh	10(5)	245017	34612	9(6)	150941	16501
Adilabad	1	4906	245	1	5569	278
Anantapur	(2)	4505	317	(2)	2310	221
Godavari (East)	2	79030	13469	1	20100	3417
Krishna	(1)	126101	18915	(2)	68710	8384
Kurnool	7(2)	30475	1666	7(2)	54252	4201
Chattisgarh	2	1077	135	1	160	40
Rajnandgaon	2	1077	135	1	160	40
Gujarat	5	534667	15696	2	364389	10799
Kachchh	2	468112	13877	2	364389	10799
Amreli	2	62125	1553	-	-	-
Bhavnagar	1	4430	266	-	-	-
Madhya Pradesh	(2)	443000	54778	(2)	242035	31321
Katni	(2)	443000	54778	(2)	242035	31321
Karnataka	-	-	-	(1)	45000	4500
Chiradurga	-	-	-	(1)	45000	4500
West Bangal	1	474	24	1	96	8
Bankura	1	474	24	1	96	8

Figures in parentheses indicate the number of associated mines.

Table – 27 : Production of Clay (Others), 2006-07 and 2007-08 (p)
(By Frequency Groups)

(In tonnes)

Production Group	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
All Groups	18(7)	13(9)	1224235	802621	100.0	100.0	-	-
Up to 500	2(2)	2(1)	999	356	0.1	0.1	0.1	0.1
501 to 2000	5(1)	2(3)	7022	4993	0.6	0.6	0.7	0.7
2001 to 5000	6(1)	3(1)	27453	13411	2.2	1.7	2.9	2.4
5001 to 10000	-	2	-	10876	-	1.3	2.9	3.7
10001 & above	5(3)	4(4)	1188761	772985	97.1	96.3	100.0	100.0

Figures in parentheses indicate the number of associated mines.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table – 28 : Mine-head Stocks of Clay (Others), 2006-07p)
(By States)**

(Qty. in tonnes)

State	At the beginning of the year	At the end of the year
India	23843	30341
Andhra Pradesh	19617	25185
Karnataka	337	337
Madhya Pradesh	182	1573
West Bengal	1379	1446
Chattisgarh	1540	1680
Gujarat	788	120

FOREIGN TRADE

Exports

Exports of clay (others) increased to 23,101 tonnes in 2007-08 from 19,263 tonnes in 2006-07. Exports were mainly to Malaysia (37%), Bangladesh (18%) and UAE (8%) (Table- 30).

Imports

Imports of clay (others) decreased to 22,775 tonnes in 2007-08 from 39,676 tonnes in 2006-07. Ukraine (86%) and China (7%) were the main suppliers (Table - 31).

**Table - 29 : Prices of Clay (Others), 2005-06 to 2007-08
(Domestic Markets)**

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08 (p)
White shale	Ex-mine Dhone (Andhra Pradesh)	85	85	85
White clay crude	Ex-mine Bennavolu (Andhra Pradesh)	48	50	50
Dolomite	Ex-mine Peapully (Andhra Pradesh)	50	50	50
White clay	Ex-mine Satna (Madhya Pradesh)	150	150	150

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table - 30 : Exports of Clay (Others)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	19263	82183	23101	80419
Malaysia	5855	11643	8608	18546
Bangladesh	2172	7072	4075	12195
Saudi Arabia	362	2047	1380	12067
UAE	1464	6307	1913	6425
South Africa	420	2913	822	5529
Nepal	2279	2444	1734	4864
Kenya	1212	4814	1149	4807
Sri Lanka	706	4057	686	3945
Korea, Rep.of	44	783	616	3139
Syria	2774	24428	-	-
Other countries	1975	15675	2118	8902

**Table - 31 : Imports of Clay (Others)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	39676	191800	22775	120574
Ukraine	36037	149306	19667	84847
USA	101	3737	1017	14035
China	2970	24924	1600	12532
Germany	78	3135	174	3526
France	222	3264	58	1679
Brazil	-	-	107	1079
Australia	-	-	19	601
Indonesia	228	3438	38	547
Spain	5	462	8	165
UK	14	3173	2	86
Other countries	21	361	85	1477

4. Shale

Shale which occurs with limestones as parting is rich in alumina content. The shale was posing a problem in the captive mines of cement companies as the clay content in shale was responsible for reducing the quality of limestone. Now, with better understanding, it is utilised as a source of alumina in cement making.

PRODUCTION & STOCKS

Production of shale used in manufacture of cement at 2,823 thousand tonnes in 2007-08 decreased nominally than previous year. There were 5 reporting mines in both the years 2006-07 & 2007-08. About 93% of total production of shale was reported as an associated mineral by 12 limestone mines in 2007-08. About 100% production was reported by captive mines of cement plant in both the years. The share of public sector was 3% as against 4% in the previous year.

Karnataka contributed 28% of the total production of shale followed by Madhya Pradesh (20%), Maharashtra (19%), Himachal Pradesh (18%), Andhra Pradesh (14%) and remaining 1% by Meghalaya (Tables - 32 to 34).

Mine-head stock at the end of 2007-08 was 37 thousand tonnes as against 30 thousand tonnes in the previous year (Table-35). The average daily employment of labour in 2007-08 was 33 as against 34 in the previous year.

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

Table – 32 : Producers of Shale, 2007-08

Name and address of producer	Location of mine	
	State	District
*The ACC Ltd. Cement House, 121, Maharshi Karve Road, Churchgate, Mumbai-400 020.	Karnataka Himachal Pradesh	Gulbarga Bilaspur
*Ultratech Cement Ltd. 'A' Wing, Ahura Centre, 1 st floor, Mahakali Caves Road, Andheri (E) Mumbai-400 093.	Maharashtra Andhra Pradesh	Chandrapur Kurnool
*Gujarat Ambuja Cements Ltd. P.O. Darlaghat, Taluqa: Arki, Dist. Solan-171 102, Himachal Pradesh.	Himachal Pradesh Maharashtra	Solan Chandrapur
*Jaypee Rewa Cement Ltd. P.O. Jaypee Nagar, Dist. Rewa (M.P.) - 486 450.	Madhya Pradesh	Rewa
Vasdatta Cements, (Prop.Kesoram Industries, Ltd Post : Sedam - 585 222, Dist. Gulbarga Karnataka.	Karnataka	Gulbarga

* Producing as an associated mineral with limestone.

**Table – 33 : Production of Shale, 2005-06 to 2007-08
(By States)**

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

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	2683852	67817	2849877	90779	2823089	68717
Andhra Pradesh	334796	15271	464698	18348	390540	15895
Himachal Pradesh	502780	2933	490450	4873	511950	5262
Karnataka	823260	27461	651711	23462	800439	26906
Madhya Pradesh	425728	3832	474720	4272	556864	5051
Maharashtra	597288	18320	620286	33459	533332	14315
Meghalaya	-	-	148012	6365	29964	1288

KAOLIN, BALL CLAY, OTHER CLAYS AND SHALE

**Table – 34 : Production of Shale, 2006-07 and 2007-08
(By Sectors/States/Districts)**

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

State/District	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	5(11)	2849877	90779	5(12)	2823089	68717
Public sector	1(0)	102000	4794	1(0)	71542	3577
Private sector	4(11)	2747877	85985	4(12)	2751547	65140
Andhra Pradesh	3(3)	464698	18348	3(3)	390540	15895
Anantapur	1	3940	355	1	3370	304
Kurnool	(1)	153000	3978	(1)	117701	3766
Nalgonda	1(2)	205758	9221	1(2)	197927	8248
Rangareddy	1(0)	102000	4794	1	71542	3577
Himachal Pradesh	0(2)	490450	4873	(2)	511950	5262
Bilaspur	(1)	135600	2034	(1)	166590	2499
Solan	(1)	354850	2839	(1)	345360	2763
Karnataka	(1)	651711	23462	(2)	800439	26906
Gulbarga	(1)	651711	23462	(2)	800439	26906
Madhya Pradesh	(2)	474720	4272	(2)	556864	5051
Rewa	(2)	474720	4272	(2)	556864	5051
Maharashtra	1(3)	620286	33459	1(3)	533332	14315
Chandrapur	1(1)	194374	11506	1(1)	124736	6627
Yavatmal	(2)	425912	21953	(2)	408596	7688
Meghalaya	1(0)	148012	6365	1	29964	1288
Khasi Hills East	1(0)	148012	6365	1	29964	1288

Note : Figures in parentheses indicate the number of associated mines.

**Table – 35 : Mine-head Stocks of Shale, 2007-08 (p)
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
India	30415	37270
Andhra Pradesh	-	30542
Meghalaya	30415	6728