

## Indian Minerals Yearbook 2021

(Part- III: Mineral Reviews)

## 60<sup>th</sup> Edition

# MINOR MINERALS 30.9 FIRECLAY

(ADVANCE RELEASE)

#### GOVERNMENT OF INDIA MINISTRY OF MINES INDIAN BUREAU OF MINES

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### 30-9 Fireclay

The name fireclay is given to a group of refractory clays which can withstand temperatures above Pyrometric Cone Equivalent (PCE) value of 19. Refractoriness and plasticity are the two main properties needed in fireclay for its suitability in the manufacture of refractory bricks. A good fireclay should have a high fusion point (>1,580 °C) and good plasticity. Fireclay containing high alumina and low iron oxide, lime, magnesia and alkalies is preferred by refractory manufacturers. The aluminous (kaolinitic) variety of fireclay is more refractory because of its hardness and density and absence of iron, giving it a white-burning colour. The absence of alkalies gives it a very high fusion temperature.

#### RESERVES/RESOURCES

India possesses substantial reserves of fireclay. The best deposits occur in association with the coal seams in the Lower Gondwana Coalfields of Andhra Pradesh, Jharkhand, West Bengal, Madhya Pradesh and Neyveli lignite fields in Tamil Nadu. Notable occurrences of fireclay, not associated with coal measures, are reported in Gujarat, Jabalpur region of Madhya Pradesh and Belpahar—Sundargarh areas of Odisha. The reserves of fireclay are substantial but reserves of high-grade (non-plastic) fireclay containing more than 37% alumina are limited.

Reserves/Resources of fireclay as per NMI data, based on UNFC system as on 1.4.2015, have been estimated at 722.83 million tonnes. Out of these, 27 million tonnes are grouped under Reserves category while the bulk, i.e., 695.79 million tonnes are classified under Remaining Resources category. Out of 27 million tonnes Reserves, 13.29 million tonnes are Proved Reserves and 13.74 million tonnes are Probable Reserves. Out of the total Reserves/Resources, Odisha accounts for 24% followed by Madhya Pradesh (18%), Tamil Nadu (16%), Jharkhand (9%) and Gujarat & Rajasthan (8% each). Gradewise, Refractory-plastic grade accounts for 37% followed by Refractory-nonplastic/semi-plastic (16%) and Refractory-unspecified (14%). The remaining 33% are of Others, Unclassified and Not-known grades (Table-1).

#### **EXPLORATION & DEVELOPMENT**

The exploration & development details if any are covered in the Review on Exploration & Development under "General Reviews".

#### **PRODUCTION**

As per Govt. of India Notification S.O. 423(E), dated 10<sup>th</sup> February 2015, 'fireclay' has been declared as 'Minor Mineral', hence the producers report the production data directly to the respective States and not to IBM. However, efforts were made to collect this information through correspondence with the State Directorates of Mining and Geology of individual States or visiting their websites. But data of only a few states could be collected. All possible information/data that could be gathered has been presented in this Review.

Statewise production of fireclay during 2018-19 to 2020-21 is furnished in Table-2.

Table-2: Statewise Production of Fire clay

(In tonnes)

State		Year	
	2018-19	2019-20	2020-21
Gujarat	638145	-	-
Andhra Pradesh	47011	55254	27090
Maharashtra	-	-	-

Source: As received from State DGMs and their websites.

Note: " - " NA

#### USES AND SPECIFICATIONS

Fireclays are used in the manufacture of cement, bricks, blocks, retorts, crucibles, mortars, masses, pottery, floor tiles, etc. Low-grade material is used for manufacturing heavy sanitaryware, such as, pipes and bath tubs. Firebricks manufactured are used where heat generation is involved, such as, in furnaces, kilns and ovens. Firebricks are extensively used in metallurgical industries.

Fireclays are usually graded into: i) Low duty ii) Intermediate duty iii) High duty and iv) Super duty, depending upon their capacity to withstand temperature before melting. The Low duty fireclay can withstand temperatures between 1,515 and 1,615 °C (PCE 19–28); Intermediate duty fireclay up to 1,650 °C (PCE 30), High duty fireclay up to 1,700 °C (PCE 32); and Super duty beyond 1,775 °C (PCE 35).

Crude fireclay and other clays including kaolin (china clay) are also used in a few cement manufacturing plants to increase the alumina content in the raw meal and its plasticity. Cement Industry

Table – 1: Reserves/Resources of Fireclay as on 1.4.2015 (By Grades/States)

(In '000 tonnes)

General State         Provod         Provod         Frobable         Total         Frasibility         Provod         Frasibility         Resibility         Massable State         Frobable         Total         Frobable			Res	Reserves					Remaining	Resources				- -
STD121   STD122   CA7   STD211   STD221   STD223   STD223   STD223   STD224   STD2	Grade/State	Proved	Prof	oable	Total	Feasibility	Pre-feas	sibility	Measured	Indicated	Inferred	Reconnaissance		Iotal Resources
stronal         1325         5035         8707         27037         13878         30155         1824         6429         54409         6429		111016	STD121	STD122	(A)	31D211	STD221	STD222	10271	31D332	31D333	510334	(D)	$(A^{T}B)$
symposition         30         13348         3231         2607         1397         86980         - 113548         1           orybusic         2271         1113         3663         4099         18234         3231         2607         1397         86980         - 113548         1           orybusicic         2271         1113         2606         14248         5352         9483         6625         947         28864         5146         268861           ryunspecified         641         302         772         1715         1884         2394         3420         7251         407         40935         125         63647           fied         821         749         381         1951         194         1382         823         205         944         4184         7407         833         1525         63647           wn         2         7         152         194         1382         823         205         4184         7407         833         1525         444           genth         1252         40         423         64         96         127         1140         1574         340         44935         1452         340 </th <th>All India: Total</th> <th>13295</th> <th>5035</th> <th>8707</th> <th>27037</th> <th>13878</th> <th>30155</th> <th>18260</th> <th>49290</th> <th>54093</th> <th>524011</th> <th>6104</th> <th>695791</th> <th>722829</th>	All India: Total	13295	5035	8707	27037	13878	30155	18260	49290	54093	524011	6104	695791	722829
Yearn-plante         2069         782         813         3663         4099         15234         3231         2607         1397         86980         -         113548         1           Yy-Jonni-plante         2271         1113         2076         5460         2492         4835         3074         4076         4674         238564         5146         262861         2           Yy-Junspecified         743         2088         4666         14248         5322         5983         6625         945         010         69444         -         90538         1           yy-unspecified         743         320         1384         1382         8282         205         30         10020         -         1553         635         40         10020         -         1563         1563         1364         -         1563         1166         1344         -         1563         137         1087         417         1000         -         1464         -         1465         2653         1499         1493         1563         1466         1466         1466         1466         1466         1466         1466         1467         14184         1477         1611         15	By Grades													
Orphalistic         2271         1113         2076         5460         2492         4835         3074         4076         4674         238564         5146         262861         2           Orphalistic         7493         2088         4666         14248         5552         5883         6623         945         2010         69444         -         90588         1           Orphalistic         4641         302         772         1142         1384         3294         3420         4076         69444         -         90588         1           And         641         1921         149         1382         283         205         417         10020         -         90588         1           And         122         74         134         1384         3420         41845         74070         833         15253         1           And         125         127         140         157         140         157         140         140         140         140         140         140         140         140         140         140         140         140         140         140         140         140         140         140 <th< td=""><td>Refractory-non- plastic/semi-plastic</td><td>2069</td><td>782</td><td>813</td><td>3663</td><td>4099</td><td>15234</td><td>3231</td><td>2607</td><td>1397</td><td>08698</td><td>•</td><td>113548</td><td>117211</td></th<>	Refractory-non- plastic/semi-plastic	2069	782	813	3663	4099	15234	3231	2607	1397	08698	•	113548	117211
ry-unspecified         7493         2088         6625         945         2010         69444         -         90558         1           ry-unspecified         641         302         772         1715         1384         2394         3420         7551         44935         125         63647           red         641         302         372         1715         1384         2394         3420         7551         44935         125         63647           wn         -         -         -         -         -         157         1382         3420         751         44935         125         63647           wn         -         -         -         -         -         157         340         1484         7407         1553         1552           red         -	Refractory-plastic	2271	1113	2076	5460	2492	4835	3074	4076	4674	238564	5146	262861	268321
fied         821         742         1715         1384         2394         3420         7251         4137         44935         125         63647           wn         -         -         -         -         157         1384         2394         3420         7251         4137         44935         165         -         12653           wn         -         -         -         -         157         1384         1382         88.3         205         30         10020         -         12653           readesh         1252         40         644         1934         771         1400         1574         56         417         10211         132         1456           garh         1252         40         644         1934         771         1400         1574         56         417         1021         132         444 <t< td=""><td>Refractory-unspecified</td><td>7493</td><td>2088</td><td>4666</td><td>14248</td><td>5552</td><td>5983</td><td>6625</td><td>945</td><td>2010</td><td>69444</td><td></td><td>90558</td><td>104806</td></t<>	Refractory-unspecified	7493	2088	4666	14248	5552	5983	6625	945	2010	69444		90558	104806
fred         821         749         381         1951         194         1382         823         205         30         10020         -         12653           wn         -         -         -         157         327         1087         3420         41845         7070         -         12653           randesh         1252         40         642         1934         771         1400         1574         56         417         1011         132         1452           randesh         1252         40         642         1934         771         1400         1574         56         417         1011         132         1462           randesh         135         23         24         433         68         77         140         167         76         44         76         444         76         444         76         444         76         444         76         444         76         444         76         444         76         113         450         444         76         444         76         444         77         444         77         447         77         447         77         447         77	Others	641	302	772	1715	1384	2394	3420	7251	4137	44935	125	63647	65362
wn         -	Unclassified	821	749	381	1951	194	1382	823	205	3.0	10020		12653	14604
Pradesh         1552         40         642         1934         771         1400         1574         56         417         10211         135         14562           garth         -         -         -         -         -         -         -         44         -         3161           rearth         315         -         -         -         -         -         -         44         -         44         -         44         -         44         -         44         -         44         -         44         -         44         -         44         -	Not-known	ı	•	•	•	157	327	1087	34206	41845	74070	833	152525	152525
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sgarth         315         23         94         433         68         27         17         7180         3400         10435         -         44           A. Sashmir         -         -         -         -         -         -         -         44         -         44           A. Sashmir         -         -         -         -         -         -         -         4914         4914           A. Sashmir         -	Assam	1	1	•	1		•	•	•	•	3161	1	3161	3161
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& Kashmir         -         56         287         1193         664         966         2120         1053         53526         -         59522           & Kashmir         -         -         -         -         -         -         -         4914         4914           nd         -         -         -         -         -         -         -         4914         4914           nd         -         -         -         -         -         -         -         4914         4914           day         -         -         -         -         -         -         -         4914         4914         4914           reparate         -         -         -         -         -         -         -         -         4914         4914           reparate         -	Delhi	ı	1	•	•			•	9	13	45	ı	64	64
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762       -       -       762       667       746       -       -       758       8514       -       10684         -       -       -       -       -       -       379       -       370         -       -       -       -       -       -       371       -       3721         981       -       377       1359       201       580       1349       -       419       11114       958       14622	Tamil Nadu	2523	458	155	3136	3952	3971	1842	1561	•	102202		113528	116663
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	West Bengal	981		377	1359	201	580	1349	1	419	111114	958	14622	15981

Figures rounded off.

has been the major consumer of crude fireclay followed by Refractory, Ceramic and Iron & Steel industries and Other industries, such as, pesticide, alloy steel, graphite products, foundry, sugar, etc.

#### **FUTURE OUTLOOK**

Fireclay is one of the most important minerals used in the Refractory Industry. India has huge reserves of fireclay and there does not seem to be any problem in respect of supplies to the Refractory Industry in the near future. However, a serious dearth

is being felt in the availability of high-grade fireclay analysing 37% & above  $Al_2O_3$  with  $Fe_2O_3$  and fluxing impurities less than 2% for supply to the refractories. To fulfil the increasing demand of the Refractory Industry, it is imperative that deposits of high-grade fireclay be explored and delineated.

The export prospect of fireclay is relatively less as it is considered as low-value high bulk mineral. However, fireclay bricks as a commodity could have high export potential and therefore must be encouraged.