

31 Diatomite

Siliceous sediments of Lower Cretaceous age formed almost entirely of the fossilised skeletal remains of microscopic single cell aquatic plants called diatoms (bacillariophyta) are known as diatomite or diatomaceous earth. These microscopic algae have capability of extracting silica from water to produce their skeletal structure. Accumulation of fossil diatom deposits when subjected to pressure and other sediment conjunctions form diatomite. Diatomite is extremely fine grained and highly absorbent. Each particle is porous and has honeycomb like structure. It is also called 'Kieselguhr'. It has a chemical composition $\text{SiO}_2 \cdot n\text{H}_2\text{O}$ which is similar to opal or hydrous silica. Commercial diatomite contains 85-94% SiO_2 , 1 to 7% Al_2O_3 , 0.4 to 2.5% Fe_2O_3 , 0.1 to 0.5% TiO_2 ,

0.03 to 0.2% P_2O_5 , 0.3 to 3% CaO , 0.3 to 1% MgO , 0.2 to 0.5% Na_2O , 0.3 to 0.9% K_2O and 0.1 to 0.2 % organic matter and soluble salts . A workable diatomite deposit of significance has not been established in the country. Almost the entire domestic requirement of diatomite is met through imports.

RESOURCES

The occurrences of diatomite are reported from Gujarat, Rajasthan, Tamil Nadu, Andhra Pradesh and Camorta & Trinicutta Islands in Andaman and Nicobar. As per UNFC system, the total resources of diatomite are estimated at 2.88 million tonnes distributed in Rajasthan (72 %) and Gujarat (28 %) (Table - 1).

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

(In '000 tonnes)

Grades/State	Reserves		Remaining resources		Total resources (A+B)
	Proved STD111	Total (A)	Inferred STD333	Total (B)	
All India : Total / Unclassified	634	634	2251	2251	2885
By States					
Gujarat	-	-	811	811	811
Rajasthan	634	634	1440	1440	2074

PRODUCTION

Production of diatomite has not been reported since 1991-92. Pandava and Khadriliya areas in Bhavnagar district, Gujarat were the producing areas prior to 1991-92.

USES

Diatomite after calcination is used in industries. Processed diatomite finds a wide range of applications due to its properties like diatom skeletal structure and constitution, low bulk density, soluble impurities, high absorptive capacity for liquids, large surface area, low thermal conductivity, mild abrasive nature and chemical inertness.

The most important use of diatomite is as a filter aid, especially for colloidal or solid solutions like beverage, fruit juice, syrup, oil and antibiotics and for water treatment to remove amoebic cysts and blood-fluke larvae. Life-saving drugs like tetracycline and insulin are filtered through diatomite. The use of diatomite in filtration applications is on the decline as ceramic & polymeric and carbon membrane technologies are increasingly adopted. However, its applications as an absorbent of vegetable oil, polyethylene, rayon liquors and as a flattening agent in paint, plastic, rubber, drugs, toothpaste, polishes and chemicals are on the rise. Diatomite is utilised for safe handling and storage of hazardous chemicals like sulphuric acid. Besides, diatomite is used as an abrasive in metal polishing in automobiles and toothpastes, pozzolanic admixtures in cement industry and animal feed stuff conditioners and explosives. It is also used as a coating material in the manufacture of ammonium nitrate fertilizer which is hygroscopic. The coating of diatomite keeps the material in granular form. Diatomite clay is the new revolution in hydroponics. In pharmaceuticals, it is used to filter syrups and other bulk drugs in liquid form, which is added in tablets, etc. In oil industry, before packing it is used to filter oil to give it a shine and to remove any suspending impurity. Beer is filtered through diatomite before packing to remove molasses. Filter

candles are made from diatomite filter aids for drinking water purification. Processed diatomite granules, 15 to 50 mm, are used in denim wash (commonly known as stonewash) to give it shine and design. It is also used as caking agent in fertilizers and pesticides and as fillers for paints and plastics. Potable water treatment and biological filtration are areas of expansion in diatomite consumption.

SUBSTITUTION

Many substances are used as substitutes for diatomite. However, the unique properties of diatomite assure its continuance in many applications. Expanded perlite and silica sand are considered as viable substitutes of diatomite for filtration purposes. As filler material, substitutes such as talc, ground silica sand, ground mica, clay, perlite, vermiculite and ground limestone are widely in use. For thermal insulation, various clays and special brick, mineral wool, expanded perlite and exfoliated vermiculite are used.

WORLD REVIEW

The world resources of crude diatomite are large to meet the market demands. The USA has the largest resources at 500 million tonnes (Table-2). The USA also remained the largest producer, consumer and exporter of processed diatomite for filtration use in the world. A resource estimate of deposits near Lompoc, California (USA), collectively could meet the world demand for centuries.

The total world diatomite production increased marginally to 2.02 million tonnes in 2007 from 1.99 million tonnes in the previous year. The USA continued to dominate world production accounting for 41% output followed by China (21%). Production in Denmark (about 10 %) was mostly of molar, an impure mixture that includes diatomite. Other important producers of diatomite in 2007 were Japan (6%), Commonwealth of Independent States, France and Mexico (4% each) (Table - 3).

DIATOMITE

**Table - 2 : World Resources of Diatomite
(By Principal Countries)**

(In '000 tonnes)	
Country	Reserve base
World : Total (rounded)	Large
China	410000
Commonwealth of Independent States	13000
Czech Republic	4800
Denmark	NA
France	2000
Japan	NA
Mexico	2000
Peru	5000
Romania	NA
Spain	NA
USA	500000
Other countries	NA

Source : Mineral Commodity Summaries, 2008.

**Table - 3 World Production of Diatomite
(By Principal Countries)**

(In '000 tonnes)			
Country	2005	2006	2007
World : Total	1822	1994	2018
China	400	420	420
Denmark (Molar)	209	196	201
France	75	75	75
Japan	130	130	120
Mexico	62	63	83
Spain	44	52	45
Commonwealth of Independent States	80	80	80
USA	653	799	830
Other countries	169	179	164

Source : World Mineral Production, 2003-2007.

FOREIGN TRADE

Exports of diatomite increased in 2007-08 to 610 tonnes as against 490 tonnes in the previous year. Exports were mainly to Denmark, Oman and Saudi Arabia. Exports of 116 tonnes Kieselguhr were to Netherlands and Nepal in 2007-08. (Tables - 4 to 5).

Imports of diatomite dropped to 1,521 tonnes in 2007-08 as against 1,645 tonnes in the previous year. Imports were from USA, Canada and China. In 2007-08, 103 tonnes of Kieselguhr were imported, mainly from Japan. Imports of tripoli earth were 63 tonnes in 2007-08, all from USA. (Tables - 6 to 8).

**Table - 4 : Exports of Diatomite
(By Countries)**

Country	2006-07		2007-08	
	Qty. (t)	Value (Rs.'000)	Qty. (t)	Value (Rs.'000)
All Countries	490	1852	610	2838
Denmark	208	1177	322	1705
Saudi Arabia	132	738	67	521
Oman	5	45	192	416
China	30	169	19	136
Sri Lanka	6	88	10	60
Chinese Taipei/ Taiwan	106	616	-	-
UK	3	19	-	-

**Table - 5 : Exports of Kieselguhr
(By Countries)**

Country	2006-07		2007-08	
	Qty. (t)	Value (Rs.'000)	Qty. (t)	Value (Rs.'000)
All Countries	87	185	116	684
Netherlands	-	-	66	420
Nepal	-	-	50	264
Bangladesh	87	185	-	-

DIATOMITE

**Table - 6 : Imports of Diatomite
(By Countries)**

Country	2006-07		2007-08	
	Qty. (t)	Value (Rs.'000)	Qty. (t)	Value (Rs.'000)
All Countries	1645	35273	1521	29696
USA	1570	33849	1420	27922
Canada	-	-	80	1434
China	55	502	14	230
Turkey	-	-	7	110
Germany	20	922	-	-

**Table - 7 : Imports of Kieselguhr
(By Countries)**

Country	2006-07		2007-08	
	Qty. (t)	Value (Rs.'000)	Qty. (t)	Value (Rs.'000)
All Countries	23	1307	103	2643
Japan	-	-	58	1467
France	6	530	1	26
China	1	343	-	-
Germany	++	5	-	-
USA	16	429	-	-
Unspecified	-	-	44	1150

**Table - 8 : Imports of Tripoli Earth
(By Countries)**

Country	2006-07		2007-08	
	Qty. (t)	Value (Rs.'000)	Qty. (t)	Value (Rs.'000)
All Countries	40	842	63	1149
USA	40	842	63	1149