CHAPTER-5

WORLD DEPOSITS

The intense prospecting & exploration activity during the last few decades had brought to light important new bauxite deposits and extensions to the already known ones. However this is not the limit. Additional medium to small zones, belts and deposits will certainly be found in the future, either in remote tropical areas or hidden below younger overburden cover[1].

The world distribution of bauxite is quite uneven and erratic. A large number of deposits are concentrated in relatively small areas, whereas large parts of some continents are entirely lacking in bauxite. As a thumb rule no bauxite occurs on the floor of the ocean and seas. However it is found on some marine islands.

The major bauxite occurrences and deposits in the world can broadly be identified into following three types. (i) Lateritic bauxite (ii) Karstic bauxite (iii) Tikhvin type deposits. Of these the lateritic bauxite deposits constitute 88%, karstic bauxite constitute 11.5% and the balance (0.5%) is accounted for by the Tikhvin type deposits[1].

I. Lateritic bauxite

Among the lateritic bauxite deposits the following bauxite provinces are identified in the world. These are however distinguishable into sub provinces and districts.

1. The South American platform belt :

This bauxite belt includes Guiana shield, North coastal plains of Guyana, Suriname, French Guyana, Amazon basin and the Northern part of the Central Brazil shield.

2. The West African belt :

The next important bauxite occurrences of the world is located over the west African craton. With its resources of 91,700 million tonnes estimated by Bardossy and Aleva (1990), this bauxite province is credited to constitute world's largest bauxite resource. The main deposits of this province occur in Guinea. However other large ones are located in Cameroon, Ghana, South Mali, Guinea - bissau, Sierra Leone, Ivory coast, Chad and Togo.

3. The Indian shield :

This includes the bauxite deposits found on Indian Peninsula. The larger deposits are located in East coast (A.P. & Orissa), M.P., Bihar, Tamilnadu, Gujarat and Karnataka - Goa belt. These have been described under chapter- 4 (description)

4. The South Eastern Asian belt :

This belt includes large bauxite deposits located in the southern part of Vietnam extending west ward into Cambodia and Laos. Other significant deposits in this belt include Indonesia and Malaysia.

5. North, West and South Eastern Australian belt :

These bauxite deposits have of late emerged as one of the largest single source of bauxite in the world. Seven bauxite bearing areas are distributed on the North and West parts of Australian craton. Weipa, Gove, North Kimberley and the Darling range constitute the major ones. In South Eastern Australia bauxite deposits are found in Great Dividing Range and Tasmania.

6. Bauxite deposit of South Eastern Brazil :

This is comparatively a small to medium sized belt distributed in the states of Minas Gerais, Sao Paolo and Santa Catarina.

7. The South East Africa

This belt includes bauxite deposits distributed in the Malagasy republic, Zimbabwe, Malawi, Mozambique & Netal province of South African Republic.

Besides the above lateritic bauxite occurrences a number of other countries are also known to possess significant lateritic bauxite deposits. They include Colombia, Costa Rica, USA, Zaire, Saudi Arabia, erstwhile USSR, Phillippines, Taiwan, Newzealand, Poland, Turkey, etc.

II. Karstic Bauxite

Karstic bauxitesare mainly identified in the following continental areas (1) North coast of Mediterranean ocean (2)Caribbean belt (3) Ural-Sibaria-Central Asia belt (4) Eastern Asia (5) Iran - Himalaya belt of Asia (6) South West Pacific belt (7) North American belt.

Besides the above there are few small karstic bauxite deposits lying out side above belts.

III. Tikhvin type deposit

This type of deposits are mainly distributed in (1) East European province forming parts of erstwhile USSR (2) Korean-Chinese belt comprising medium size deposits in North east China and Korean Peninsula. Remaining Tikhvin type deposits are scattered over the Ural mountains and south central Asia. These deposits are mostly distributed between 30° and 65° North and their geological distribution largely coincides with the occurrences of karstic bauxite.

By making an over view of world bauxite deposits the following generalised inferences can be drawn :-

1. A majority of bauxite deposits are concentrated in a restricted number of areas with limited extent.
2. The lateritic bauxite ranging in age from Tertiary to Recent, are all situated in the tropical and sub tropical belts on either side of the equator.

3. All bauxite deposits found at higher altitudes are assigned Mesozoic to Palezoic ages.

4. The present world distribution of bauxite deposits is a sum of situation resulting due to climatic, geo-morphological and hydrogeological conditions prevailing during the time of their formation.

A detailed discussion on ten leading bauxite producing countries of the world on basis of their production ranking during 1989, is given in the proceeding paragraphs :-

5.1 AUSTRALIA

5.1.1 Australia with its production of 38,583,000 tonnes during 1989, is the world leader in bauxite production. The lateritic bauxite has been won from virtually all states of Australia but the main economically important deposits have been reported from the following regions:-

5.1.2 Deposits of Cape York Peninsula (Queensland)

1. Cape York Peninsula (Queensland state)

a) Weipa-Aurukun Deposit
b) Escape river

2. Northern territory consisting of

a) Gove Deposit
b) Marchinbar Island
c) Cobourg Peninsula and Croker Island

3. Western Australia

a) Darling Range deposit
b) Mitchell Plateau deposits

4. South East Australia

a) Tamborine Mount, Hampton area
b) Inverell
c) Moss Vale
d) South Gippsland
e) Myalla

5.1.2 Deposits of Cape York Peninsula (Queensland)

5.1.2.1 The Weipa - Aurukun Bauxite deposit[1,2]

The Weipa bauxite deposit is located at the north western end of Cape York peninsula of Queensland. The deposit is situated at a height ranging from 2 to 150 m above MSL. The bauxite covered area in the belt measures 2500 sq.km[1]. The bauxite zone is 1 to 9 m thick with an average of 3m and is overlain by thin soil zone. The bauxite zone is in turn underlain by a transition zone of 5 m thickness saprolite zone 10 to 30 m thick, followed by sandy and silty mudstone of the Rolling Downs Group which form the parent rock. Mineralogically the zone comprises 20 to 50% gibbsite and 5 to 30% boehmite. The Weipa bauxite zone on an average has lower total silica while the iron content is variable. The bauxite and laterite occurrences in the southern and SE parts of the area are called Aurukun group deposits. At present three large companies are mining bauxite at Weipa which has a total recoverable reserves of 2500 million tonnes[1]. In Aurukun area, two leaseholds are working which together have 500 million tonnes of proved and probable reserves of beneficiated bauxite with an average grade of 52.9% Al_2O_3 and 7.9% reactive silica.

5.1.2.2 Escape River deposit[1]

In this district the deposits of bauxite are located on the northeastern tip of Cape York peninsula near the estuary of Escape river. The laterite & bauxite have been formed on a gently undulating Late Cretaceous to Pre-Pliocene planation surface and are located at a height of 2 to 40 m MSL. The deposit covers an area of 30 sq.km. Three bauxite/laterite zones are distinguished here which have gradational contacts. They are identified as :

Top	-	Pisoidal zone either high iron or low iron
Centre	-	Pisoidal to nodular zone
Bottom	-	Thin nodular zone.

The bauxite is red coloured and high in iron which grade laterally and downwards into white pink or pale orange, low iron bauxite. The chemical composition of bauxite ranges from 32 to 52% Al_2O_3, 13 to 38% SiO_2,

0.7 to 27% Fe_2O_3 and 1-2.4% TiO_2(Gibbsite is the main aluminious mineral while boehmite varies from traces to 30%. The bauxite is a product of insitu weathering. The area has a probable reserves of 5 million tonnes having white, low iron, siliceous bauxite.

5.1.3 Northern Territory

5.1.3.1 Gove deposit : The Gove peninsula is the north eastern part of Northern Territory, which is located at the junction of Arafura sea and the Gulf of Carpentaria. The deposits are located between 40 to 100 m height above MSL and cover a laterite/bauxite blanket measuring 120 sq.km., of which 63 sq.km. contains commercial grade bauxite. The bauxite comprises three zones namely (1) Loose pisolitic bauxite upto 10 m thickness. (2) Cemented pisoidal reddish coloured bauxite upto 1.5 m thickess (3) tubular bauxite upto 3m thickness comprising red brown cemented massive rock which is dissected with irregular vesicular cavities. The parent rock is presumed to be Early Cretaceous Mullaman beds. The bauxite thickness and grade are highly variable and cannot be correlated. Mineralogically, the bauxite is mainly composed of gibbsite with not more than 3 % boehmite. Iron is present as haematite and geothite. The silica varies from average 2 % to 20 %. The bauxite is believed to have formed as a result of residual weathering but has been later reworked and chemically reconstituted perhaps as a result of changes, in sea level. The reserves of bauxite estimated in this belt are placed at 282 million tonnes with an average of 51.1 % Al_2O_3 and 4.2 % SiO_2 (1).

Gove lateritic bauxite is similar to Weipa deposit in that it caps relatively low level plateaux and has a zonal sequence in the upper part similar to that of Weipa, where a red brown soil is immediately underlain by a zone upto several metres thick comprising essentially of pisolites placed in interstitial material (2).

5.1.3.2 Marchinbar Island

This deposit is located on north easterly Wessel Islands which are northerly extension off the north coast of Arnhem land. Laterite occurs here

in many small pockets which are distributed over the island. The bauxite deposits cover a mineralised area of 1 sq.km. The bauxite horizon consist of two zones namely (1) Pisoidal bauxite hich is 1 to 4m thick, comprising massive zone having red dark pisoids cemented by a light brown to pink matrix. (2) tubular bauxite which is 1-2 m thick and red to brown in colour. The bauxite horizon is underlain by 1 to 5 m thick brown laterite and saprolite. The chemical composition of bauxite though highly variable, ranges as follows : Al_2O_3 43 - 52 %, Fe_2O_3 10 to 24 %, TiO_2 2 to 4 % and SiO_2 2 to 9%. The bauxite is essentially gibbsitic. The total probable reserves are estimated at approximately 10 million tonnes.(1)

5.1.3.3 (C) Cobourge Peninsula and Croker Island Deposits

In this area the bauxite deposits are located at the northern edge of north Australian craton. Deposits of re-worked bauxite occur on a gently sloping surface near the north coast of Cobourge Peninsula and Croker island. The bauxite profile can be described from top to bottom as (1) 1 to 3m thick, red pisoidal bauxite zone (2) 3 to 5 m thick Pisoidal and tubular laterite zone (3) 3 to 7 m thick residual lateritic - saprolite zone. The chemical composition of bauxite varies from 36 to 50 % Al_2O_3, 7 to 20 % SiO_2 and 7 to 19 % Fe_2O_3. The bauxite is essentially gibbsitic accompanied by kaolinite(1).

5.1.4 Western Australia

5.1.4.1 Darling Range Deposit

This deposit is located near-Perth in Western Australia. The Darling range is an undulating deeply dissected plateau which extends for 350 km in North - South direction and varies in width from 40 to 60 m. The western 35 to 50 kms of this plateau is covered with a lateritic blanket. Geologically the Darling Range is located in the western gneissic terrain of Yilgarn block. The belt can be divided into (a) Western group of deposits (b) Eastern group of deposits.

(A) Western Group of Deposits (Alcoa lease area)

In the western group of deposits about 15000 sq.km is covered with laterite and bauxite. In this belt the bauxite zone measures 2 to 10 m (average 4 m) thick which is ochreous to red in colour, friable, earthy and very porous and consist of gibbsitic pisolites, irregular nodules and concretions. The parent rock appears to be mainly granitic with numerous almost vertical dolerite dykes. The chemical composition of the ore varies between 35 to 40% Al_2O_3, 1 to 2 % reactive SiO_2, 10 to 20% Fe_2O_3 and 23 to 24 % LOI. The bauxite has a particularly high content of organic matter. Mineralogically it comprises 45 to 60% gibbsite, 0.5 to 1% boehmite, 18 to 22 % quartz and 15 % goethite. The leases on this group of deposits have proved, probable and possible reserves of 2500 million tonnes[1].

(B) Eastern Group of Deposits (Worsley lease area)

This group of deposits are centered around Mount Saddleback and are derived from metabasalt and related rocks. The Mt. Saddleback bauxite deposit is located on the Darling Range plateau above 250 to 490 m MSL. The bauxite profile comprises a bauxite zone having a thickness 2 to 15 m (average 5 m). The parent rock comprises meta basalt of Marradong Formation and impart a characteristic freedom from quartz and high iron content in the ore zone. Around 150 individual bauxite deposits are located in this belt. The bauxite is high in iron oxide and low to very low in reactive silica. The bauxite is mainly composed of gibbsite (30 to 70%), goethite (10 to 30 %) and haematite (5 to 20%). A total mineable ore reserves locked up in Mt. Saddleback deposit are placed at 400 million tonnes[1].

5.1.4.2 Mitchell Plateau Group of Deposit

This area falls in the north Kimberley bauxite district located on the north coast of West Australia. The Mitchell plateau comprises an intensely dissected mesa type landscape varying in height from 430m in South to 200 m in North. The laterite and bauxite covered plateaux and mesas are distributed over a strike length of 65 km

from North to South. The bauxite profile comprises a pale yellow brown to light reddish coloured, 0.5 to 8 m thick zone of massive, fragmental, nodular,pisoidal and tubular bauxite. The parent rock appears to be basaltic lava - pyroclastic rocks of Carsom Formation. The bauxite horizon is highly variable both horizontally and vertically. The mineralogical composition of bauxite ranges from 20 to 95% gibbsite, 0-10% boehmite, 2-14% haemetite etc. The exploration on the Mitchell plateau bauxite deposit place the reserves at 457 million tonnes with an average grade of 43.4% Al_2O_3 [1].

5.1.5 South East Australian Bauxite Province

This province differs from the West and North Australian bauxite province in structural aspects. The deposits are located on a Paleozoic orogenic belt called 'Tasmanian Geosyncline'. In this province five bauxite districts are identified which have several features in common. They are presumably of Miocene age. Their reserves are small even insignificant, as compared to huge reserves in the West and North Australian provinces. The bauxite in all five districts is gibbsitic in nature and is accompanied by goethite, haemetite, kaolinite and anatase. The burried deposits at Muse , Tasmania contain upto 18% siderite which fills veins and cavity in the bauxite. The deposit at Inverell, South Gippsland and Muse are covered by younger sediments and basaltic flows [1].

5.2.0 Guinea [1]

Guinea,a leading bauxite producer of West Africa, also ranks second in world bauxite production(16,553,000 tonnes during 1989). The majority of the reserves of West Africa (9,100 million tonnes) are concentrated within the geographical boundary of Guinea. Patterson et.al (1906) estimated reserves of 8,000 - 10,000 million tonnes, in the entire country.

In Guinea, majority of the bauxite deposits are situated over the Foute Djalon rising upto 1500 m above MSL. This dome-shaped ancient planation surface is largely dissected by Neogene erosional valleys and plains.

The bauxite caps the plateaux. The important individual deposits of Guinea are detailed below[1]:-

5.2.1 Boke-Gaoual Bauxite Deposits[1]

The area is located in the North-West part of Guinea at the height of 200-600m above MSL. The entire bauxite district/deposit is 150 km long and 70 km wide where following four groups of deposits are distinguished :-

a) Sangaredi-Sampiri
b) Ayekoye
c) Diandian - Ouroube
d) Gaoual

5.2.1.1 Sangaredi - Sampiri Deposits -

Out of the 900 million tonnes total reserves estimated in entire Sangaredi - Sampiri Deposit, the Sangaredi deposit is having the largest reserves (200 million tonnes) and it differs geologically with other deposits of the area. It is located on the eastern edge of an extended plateau near Kogon river and spreads over 4 sq.km, mineralised area, capped by continuous reworked bauxite deposits. The upper redeposited bauxite zone has an average thickness of more than 20 m while the middle and lower zones have 25-30 m & 5-10 m thickness. Physically, it has many variations. A brown, massive bauxite with clay filled pores of less than 5 mm appears mostly at the surface. At a lower horizon, an oolitic bauxite with pebbles of concentric structures may occur. These largely have distinct chemical and mineralogical compositions. The Sangaredi bauxite is characterised by high alumina and low iron contents. The range of its chemical composition is given below :

Al_2O_3 40 - 68%, SiO_2 0.1 - 30%, Fe_2O_3 0.8 - 33 % and TiO_2 1.5 - 14%. Gibbsite is the main alumina mineral accompanied by 1-35% boehmite (average 6%). The mining started here in 1973 and the production reached to 10 Mtpy in 1984. The ore is transported by train to the port of Kamsar, 140 km. to the SW of Sangaredi[1].

5.2.1.2 The Ayekoye Group of Deposits

The area located to the north of the Sangaredi-Sampiri group of deposits forms the central part of the Boke-Gaoual bauxite deposits. The deposits have a total reserves of about 850 Mt with an average 44-45% Al_2O_3 and 1.7-2% SiO_2. The area is similar to the Sangaredi-Sampiri area. Here the basement is composed of horizontal or weekly folded Devonian shales with abandant fossils. Dolerite dykes and sills are interstratified with the sediments as well as cross cutting them. The bauxite of economic grade is formed mainly over dolerite, although the parent rock could be hornfels or shale.

As far as chemical and mineralogical composition is concerned, bauxite generally contains 40 -50% Al_2O_3 and 1-3 % SiO_2. The mineralogical composition of the bauxite is essentially gibbsite, accompanied by less goethite and hematite.

5.2.1.3 The Diandian-Ouroube Deposits

Having a length of 25 km, this is the smallest group of deposits of Boke-Gaoal bauxite belt and is located to the west of Ayekoye area at 200-250 m above MSL. The possible and probable reserves in the deposits are estimated to be 850 million tonnes with 45 % Al_2O_3 as cut off grade. Geologically, it is similar to Ayekoye deposit. The two main bauxite bearing plateaux are called Diandian and Ouroube. As far as bauxite profile is concerned it is of insitu origin. The thickness of the bauxite horizon is generally 7-8 m and it contains 45 - 60% Al_2O_3 and 0.8 - 3 % SiO_2. Mineralogically it mainly comprises gibbsite[1].

5.2.1.4 The Gaoual deposits

The area having an estimated reserves of 750 million tonnes, is located to the north east of Ayekoye deposit at a height of 500-600 m above MSL on the main plateaux.

Here the bauxite profile is of insitu nature and is similar to Ayekoye belt. The bauxite horizon is 5-8m thick, but locally it may reach 15-20 m. The mineralogical composition is gibbsitic. The bauxite composition varies generally between the following assay values :-

40-50 % Al_2O_3, 1-4 % SiO_2, 8-30 % Fe_2O_3 and 1.5-3.0 % TiO_2 (1).

5.2.2 The Fria Bauxite Deposit

The Fria bauxite district is located to the south of the Bok e-Gaoual bauxite district and form/western rim of the Flouta-Djalon plateau area. The basement of the area is composed mainly of Silurian graptolitic Slate and siltstone cut locally by dolerite sills and dykes. The main bauxite deposits capping the plateaux are located near Fria. The area is 115 km long in north-south direction and 40-50 km wide. The individual deposits occupy 3-7 km^2. The top of the plateaux are covered by an almost continuous bauxite layer. The entire weathering profile is 20-30 m thick. On the upper slopes of some plateaux, redeposited bauxite occur. The main deposits of the Fria area are Fria, Kimbo, Tambakoui, Vonkoma, Bogoro and Kondokoure. Other large deposits to the north are Sodiore and Gouba. The total reserves in the Fria bauxite district are about 1,200 million tonnes with a cut-off value of 40 % Al_2O_3. The chemical composition of selected samples of bauxite representing the entire profile is Al_2O_3 57.1 - 62.8%, SiO_2, 0.9 - 1.3%, Fe_2O_3 1.5 - 8.6%, TiO_2 1.2 - 2.2%, LOI 30.6 - 32.0 % and CaO 0.00 - 0.53%. Gibbsite is the main alumina mineral (1).

5.2.3 Kindia Bauxite Belt

This area is located in the western part of Guinea at a height of 180-600 m above MSL. The most important deposits include those of Debele plateau, followed by Bajala - Balan, Dougou, Meengi & Feri fou. The average thickness of the ore is 7 m. The basement in the area consists mainly of Ordovician sandstone and siltstone. The silurian slates serve as parent rock for the bauxite - laterite profiles (1).

5.2.4 The loss Islands bauxite deposit

This belt is located in southwest part of Guinea on Kassa and Tamara islands forming part of Los Islands Archipelago. The basement and possible source rock for bauxite is Nephelene Syenite. The bauxite zone ranges from 2-11m in thickness. No mining operations are foreseen on the islands because of the limited inventory of reserves[1].

5.2.5 The Tougue Bauxite deposit

The area is located in the north part of Guinea at a height 600-1000 m above MSL. The belt is 140 km long and 50 km wide and contain proved and probable reserves of more than 2300 million tonnes with an average grade of 43.7 % total Al_2O_3 and 2.8 % total SiO_2. Main deposits occur on Pontiolo, Dire, Gonkoie, Sibiko and Kokata area. The bauxite deposits are of insitu origin and can be divided into two zones namely (i) Gravel textured bauxite (1-3m thick). (ii) Ferrugenous bauxite (1-4 m thick). Chemically the bauxite horizon contains 40-50% Al_2O_3, SiO_2 1-4 %, TiO_2 1.5 - 3.0 %, Fe_2O_3 8-30 % and LOI 20 - 30%[1].

5.2.6 The Dabola Bauxite Deposit

This area is located in the central part of Guinea, to the west of the town of Dabola at a height of 800-1000 M above MSL. According to a recent estimate, the proved and probable reserves in the area are around 500 MT. and the possible reserves 300-500 MT. The ore contains 40-50% total Al_2O_3, 1-3 % total SiO_2 and 22-30 % Fe_2O_3. The bauxite deposits occur mainly on flat plateaux formed by dolerite sills. The most important deposits are found on Legetera plateau while other main deposits are; Tekoulou Goral, Tekoulou Dejal, Oursa, Sinseri, Lobiko and Nobe[1].

5.2.7 The Pita-Labe bauxite deposit

The area is located in NW part of Guinea at a height of 500-1250 m above sea level. The size of individual bauxite plateaux range from 1-200 km^2. Both insitu and redeposited types of bauxite are found in the belt. Out of 6 main bauxite bearing plateaux, the Bantigniel is best

explored while others include Koumba-Bantala, Dongol-Sigon, Bokera, Timbi-Madena and Saran.

The proved and probable reserves of the Bantigniel deposits are 250 MT. with an average composition of 46.1 % total Al_2O_3, 1.3 % total SiO_2, 25.4 % Fe_2O_3, 3.1 % TiO_2 and 23.5 % LOI. The total reserves of the entire bauxite belt are estimated at 1100-1300 million tonnes, at a 40 % Al_2O_3 cut-off. The bauxite ranges in thickness from 1-10 m[1].

Other bauxite occurrances are known in Guinea near Foreeariah east of Conakry and in the area between the Kindia and Dabola bauxite districts. Other occurrances are found in the North of the country near the town of Mali, further in NE Guinea, near Singuiri and Kankan and Finally in Southeast Guinea near Kouankan.

5.3.0 Jamaica

5.3.1 Jamaica is ranked at the third position among the world producers of bauxite (9,395,000 tonnes production during 1989). The bauxite occurs in Jamaica on a dissected plateau, 300 to 900 m above MSL and is associated with limestone karst of Middle Eocene to Lower Miocene ages[3]. They are thought to have been originated by the bauxitisation of residual material left over during the dissolution of limestone[4]. The Jamaican ore is not compact and exhibit a non plastic earthy texture. However, in the individual karst openings the deposits are thick enough to be easily mined[5]. The deposits have irregular sharp contact with the host limestone. Narrow pipes extend deep into the limestone and limestone pinnacles are seen within bauxite deposits. Individual deposits are highly irregular and their thickness varies from a few cm to 35 m. Laterally, they form networks, several kilometers in length. The tonnage of the deposits vary from few thousand to several million tonnes. The important deposits are located in the Manchester Parish, St. Anne Trelauny, St. Catherine, Clarandon, St. James and in Portland on the eastern side of the Blue Mountain Range.

Mineralogically, the deposits are predominently gibbsitic with subordinate amounts of the Boehmite. Occassionally boehmite percentage goes upto 20 %. Iron content in the ore is high and occurs as haemetite and hydrated oxide. Physically, the Jamaican bauxite is soft to moderately hard, extremely fine, porous earthy and varies in colour from dark red, reddish brown, yellowish, brown to mottled yellow colour. It is normally massive with oolitic in form but with more concretions at the top[4]. The ore contains about 50 % Al_2O_3, SiO_2 2% , Fe_2O_3 3 %, and above 26 % LOI[6]. The particles size of aluminious minerals and iron is small and for this reason no beneficiation of the ore is possible. Thus the Jamaican deposit is not considered suitable for refractory, abrasive and chemical industries except for metallurgical purposes. The Jamaican bauxite deposits are estimated to contain about 2000 million tonnes of reserves and thus occupy a comfortable position in the world reserves[1].

A number of leading bauxite mining companies of the world are working in Jamaica. Among these, KAISER, which mines bauxite at water valley, 15 km inland from Discovery Bay on the northern coast of Jamaica, is the leading producer having one of the world's largest open pit bauxite operation. Kaiser, which presently mines at St. Ann parish, is also working deposits in South Central Jamaica (St. Elizabeth Parish), and also operates mines near port Rhoades. The Aluminium partners of Jamaica (Alpart) is yet another company which operated in Essex Valley, St. Elizabeth Parish where it has Jamaica's biggest alumina plant. Alpart's bauxite depositsare relatively shallow ranging from 1.5 m to 15 m. In a few areas, the deposits form a blanket structure. Gibbsite pre-dominates although boehmite is also present. M/s. ALCAN is yet another mining company which operates two bauxite mines and two alumina plants in Jamaica. The company has properties in Manchester, St. Catherine and St. Elizabeth. The company has openpit bauxite mines at Kirkvine and Ewarton[7].

5.4 BRAZIL

Brazil is one of the largest repository of bauxite resources and is ranked at the 4th position among the leading bauxite producers of the world. According to latest estimate, Brazil has bauxite resources of about 4000 million tonnes, which are distributed along remote sub-tropical areas[1]. The most important bauxite deposits are located in Trombetas and Paragominas areas of Amozon Basin, where commercial deposits of bauxite are found[8].

The Trombetas and Paragominas provinces are centered around the small town of Paragominas, some 300 km. south of Belem and around the lower reaches of the river Trombetas, a major north bank tributory of Amazon. Though both the deposits are several hundred kms. apart, the basic characteristics of laterite in both provinces are similar. In both the localities, bauxite deposits are associated with the laterite, the lower horizon of which mainly supplies the bauxite. The laterite is overlain by a cover of clay. In the Paragominas Province the host for laterite deposits are Ipixuna and Itapecuree Formations whereas at Trombetas the host is believed to Barreiras Formation. The laterite profile in these areas can be separated into three zones which include from top to bottom the clay cover, the concretionary laterite zone and underlying saprolitic zone respectively. The major contituents of the laterite are kaolin and gibbsite, while hematite, goethite, anatase and quartz are found as minor contituents. In the last of the laterite horizon greatest concentration of gibbsite is found. The top of this horizon is massive with little or no clay while the bottom zones become blocky and increasingly richer in clays. The bauxite zone ranges in texture from amorphous, porous, spongy to zones having box works and vugs. The bauxite has a reddish or brownish colour. The main bauxite zone shows a considerable variation in thickness[8] which increases upto 8 mtrs. at places. In the Trombetas province average thickness of 3.5 to 5.5 mtrs, is recorded whereas in Paragominas province thickness of

2 to 4 mtr. is common. The area of individual deposit vary from 1 to 2 km^2 to several sq.km. There are significant reserves of bauxite which according to Bardossy and Aleva (1990) may amount to about 4,500 million tonnes[1].

5.5 INDIA

India with its 4,768,000 tonnes production during the year 1989, has been placed at 5th position among the leading producers of bauxite in the world. The country has large reserves of metallurgical grade and significant reserves of higher grades which are mainly distributed in the East Coast Belt (Orissa and Andhra Pradesh), Madhya Pradesh, Gujarat, Bihar, Karnataka, Goa, Tamil Nadu, Kerala, Uttar Pradesh and Jammu & Kashmir states. A detailed description of these individual deposits is given under chapter 4.

5.6 ERSTWHILE UNION OF SOVIET SOCIALIST REPUBLICS (NOW COMMONWEALTH INDEPENDENT STATES)

5.6.1 Erstwhile USSR ranks sixth in the world with 4,600,000 tonnes bauxite production in 1989. Three main types of bauxite deposits are distinguished in USSR(1) Lateritic bauxites, (2) Tikhvin-type bauxites and (3) Karst bauxites. The lateritic bauxites are those derived from underlying aluminosilicate rocks by 'insitu' tropical weathering e.g., Belgorod, Vysokopal'ye deposits. Tikhvin-type bauxites are deposits overlying the eroded surface of aluminosilicate rocks. These deposits are products of the erosion of lateritic-bauxite deposits e.g. Tikhvin bauxite deposit. Karst bauxite deposits are those overlying more or less Karstified surface of carbonate rocks. In USSR four main types of karst-bauxite are distinguished on the basis of constitution of the deposits and on the mode of Karstification. These four types are (1) Mediterranean (2) Kazakhstan (3) Timan and (4) Tulsk type[1].

The Meditarranean-type bauxite consists of homogeneous bauxite which passes into clayey bauxite towards the top, bottom and the edges of the deposit. They are the Karst bauxite deposits in the true sense and rest are transitional types. Most important meditarranean deposits in USSR are found in the North Ural mountain.

Kazhakhstan type bauxites are generally heterogenous and associated with clays, sandy-silty clays, carbonaceous clays, lignite, sandstones, conglomerates and oolitic iron ores; which overlie the strongly karstified carbonate bed rock. Its most typical examples are found in Kazhakhstan region of USSR, hence the name.

The Timan-type bauxite deposits are most frequently stratiform associated with claystone , siltstone, sandstone etc. with thin layers and small lenses of bauxite. The karstification of bed rock here is weak. These deposits are named after Timan Mountains of USSR.

The Tulsk type deposits are friable ochre-yellow coloured associated with Lower Carboniferous clays. Here, bauxite nests filled in-karstic funnels are found under an overburden of pyritic clays and coal measures upto 10 to 60 m thick. These are characterised by absolute lack of titanium. The type area of this bauxite type is Tulsk region of USSR(1).

Some of the major USSR bauxite deposits are described below in detail :-

5.6.2 Belgorod bauxite deposits

The Belgorod Bauxite deposit is situated on the south - western slope of the Voronezh Precambrian massif. The Pre-cambrian basement is built up of metamorphic and plutonic rocks, mainly of gneiss and granite. The peneplaned surface of the basement is covered by an Early Carboniferous lateritic weathering mantle. Bauxite is found only over the schists of the Proterozoic "Kursk-series". The bauxite deposits are situated below 450-750 m depth under a cover of Paleozoic, Mesozoic and Tertiary sediments. The deposits form elongated strips that wedge out quickly. Their length may attain one km. their width some hundred metres. The most important occurrance in the area is located at Vislovsk. The thickness of the bauxite horizon ranges from 1-20 m. It is grey to brown and red in colour. Bauxite is hard but porous with relict texture and structure and pisoidal and nodular forms. The chemical composition of the bauxite ranges 48-51 % Al_2O_3, 7-12% SiO_2, 6-8 % FeO, 16-20 % Fe_2O_3, 2-3 % TiO_2 and 11-14 % LOI. The bauxite is partly boehmitic, partly boehmitic-

gibbsitic, and locally gibbsitic-small amounts of diaspore have also been detected.

Bardossy and Aleva 1990 have estimated the deposit to contain 60 million tonnes reserves in the explored area[1].

5.6.3 Vysokopol'ye Bauxite Deposit :

The Vysokopol'ye bauxite deposit is situated on the southern flank of the Ukrainian shield. The Precambrian basement consists of amphibolite, chlorite-sericite schist, diabase, ultrabasic rock and granite intrusions. The peneplained surface of the Precambrian basement is covered by a lateritic weathering mantle. The Bauxite deposit has developed over amphibolite and chlorite-amphibolite schist, which occurs in granite. The deposit consists of strings of bauxite segregations that occur at 60-100 m depths, below a tectonically undeformed sedimentary cover.

Under a brown to red, hard, vesicular goethitic overburden of 0-4m, the bauxite horizon is found, which varies in thickness from 0.5 to 7 m (averaging 2m). The bauxite is soft in lower parts and is earthy and porous showing relict textures and often grading into pisoidal and tubular types. The upper part of the bauxite is brown to red in colour and of medium hardness. The average chemical composition of the bauxite is Al_2O_3 38%, SiO_2 8-9% and Fe_2O_3 25-29 %. Mineralogically the bauxite contains 43 % Gibbsite with 4 % boehmite. The age of bauxite formation may be Late Jurassic to Early Cretaceous. Bardossy & Aleva (1990) have estimated the deposit to contain 10 million tonnes.

5.6.4 Tikvin Bauxite Deposit :

Tikhvin bauxite deposit is located near Tikhvin, southeast of St Pettersberg (erstwhile Leningrad). The bauxite forms elongated and lenticular zones underlain by parent rock of Upper Devonian claystone and sandstone. They are covered by Lower Carboniferous sandstones and claystones.

The detritic texture and structure of the bauxite indicates towards its transported origin. It is probably derived from lateritic profiles developed on Devonian aluminosilicate rocks[9]. Its occurrence is usually not deeper than 40 m. The size of the bauxite segregations depend on the dimensions and shape of the pre-ore depressions in the bedrock. The bauxite characterized by a reddish-brown colour, is sometimes hard, friable and argillaceous[10]. It contain 36-49 % Al_2O_3, 11-18 % SiO_2 and 5-21 % Fe_2O_3. Principal minerals in the ore include gibbsite, Boehmite, Kaolinite and hematite[9].

5.6.5 Timan Bauxite Deposit :

This deposit is located at South Timan Mountain USSR. Limestone of Upper Devonian age form the parent rock. It's slightly karstified surface forms large, flat depressions filled by continental clays and sand with a maximum thickness of 40-60m. The bauxite is deposited on top of this with 4-6 m average thickness. The overburden comprises Lower Carboniferous marshy sediments, marine marls and limestone[9].

The bauxite segregations have an elongated form and wavy outlines. They occur at depths varying from 40-100 m[10]. Ore segregations have considerable area but their thickness is small (upto 2-5 m). The bauxite is kaolinite-gibbsite-boehmite and kaolinite-boehmite type and grey in colour but yellowish-white bauxite is also not uncommon.[11] It contains 40-60 % Al_2O_3 and 12-28 % SiO_2.

5.7 PEOPLES REPUBLIC OF CHINA

China stands at seventh position on the bauxite map of the world and has recorded a production of 4,000,000 tonnes during 1989. The bauxite deposits of China are associated with clays and shales of Palaeozoic age and the coal formations of Jurassic age. All known bauxite deposits of China occur in the eastern part of the country. The most valuable deposits in China are sedimentary in origin and have formed in local depressions on the edges of continental platform, during marine transgression. They lie on Upper Cambrian or Middle Ordovician limestone that weathered for a long period

of geological time. All the major sedimentary type bauxite in China have common mineral composition. The principal constituent mineral is diaspore with some boehmite in few cases. Occasional gibbsitic bauxites are also reported such as the deposit at Quemoy and Changpu in Fukien province. The bauxite deposit here overlie a basaltic horizon of Quarternary age. They are lateritic at the surface and can be easily mined. Similar deposits occur in Kwantung province and Heinam island[13,14].

The most important bauxite deposit of China are found associated with the rocks of Carboniferous and Permian age. These deposits contain 7 beds which have been named from top to bottom as A, B, C, D, E, F & G beds, in the Pershy (Benxi) Coal Basin in Liaoning province. The fourth bed is the most valuable source of bauxite in China and occurs at the base of the Middle to Upper Carboniferous rocks while it rests on Upper Cambrian/Ordovician limestone[14]. In addition to above beds some upper permian coal measures also contain 4 to 6 beds of bauxite or aluminious shale. The main characteristics of these deposits are given below:-

(1) All of these deposits are of platform origin. No deposits of geosyclinal origin have been discovered so far. (2) The deposits are mainly Carboniferous and Permian in age (3) Better quality deposits all over the country occur at the base of Middle and Upper Carboniferous formations and lie on Cambrian to Ordovician limestones that were subjected to a long period of lateratisation (4) The most valuable deposits are sedimentary in origin formed in local depressions on the edges of platforms (5) Diaspore is the major ore mineral and the deposits have low alumina/silica ratio (6) Most bauxites contain gallium and germanium in quantities sufficient for commercial utilisation. In some cases they contain a considerable quantity of uranium[14].

The main bauxite deposits of China can be grouped into the following three types :-

(1) Uniformly bedded deposits in Depression

These deposits are found in the G-bed of Late Carboniferous age and contain long lenses of bauxite.

Diaspore is the major mineral. The ore is red tc greyish white in colour and shows oolitic to pisolitic structure, containing little iron. The deposits in Kunghsiem bauxite district of Hunan province are the most representative example of this type. They have six layers of bauxite, of which the fifth one from the base show the highest alumina and lowest silica content. The bauxite ore is high grade where the alumina content is fairly uniform, assaying 60 to 70 % and silica varying between 6 to 17 %.

(2) Disrupted Deposits in Depression

These deposits are found in the Middle Carboniferous rocks which were folded, faulted and intensely eroded subsequently. The major ore mineral is diaspore with secondary boehmite in some places. In clayey rocks the diaspore content is little lower and the kaolinite content is higher. Deposits in the Hsiuwen bauxite district, Kweichow (Guizhon) province offer best examples of this type. The bauxite beds here occur between two horizons of dense aluminous shales. The ore is earthy, oolitic, detrital or dense. The formation is covered by the carbonaceous shales and limestone. The ore averages 70 % alumina, 11 % silica, 2 % ferric oxide and 2.9% titanium di-oxide.

(3) Deposits on Weathered Basalt

The deposits of this type contain bauxite with gibbsite as the major ore mineral. They are genetically related to weathered tertiary basalts and in most cases are the product of redeposition of weathered mineral. The tertiary basalt horizon is the only known horizon of gibbsitic deposit in China and the Changu bauxite district in Fukien distt. (Fujian) province is the only known zone in the main land China in which this type occurs. Ore beds 3 to 4 m in thickness are found in laterite and contain gibbsite gravel and detritals. The ore averages 47.6 % alumina, 22.4 % silica, 22.4 % ferric oxide and 4 % titanium oxide.

A detailed description of important Chinese deposits is given below :-

(A) Deposits in Hopeh (Hebei) Province :

The Peking (Beijing) G-bed belt is a promising area which extends from about 240 km. east of Beijing to about 110 km. west of it. The bauxite contains Al_2O_3 45-55% and SiO_2 20-25 %[14].

(B) Deposits in Shansi (Shanxi) Province :

The Taiyuan Tatung (Datong) G-bed area embraces major bauxite and clay districts of the province including the Taiyuan, Tatung, and Yang-chuan (Yanguan) deposit. The deposits in the Yangchuan district belong to the Kunghsein (Gongxian) Type and have both dense and Pisolitic-oolitic type bauxites[14]. The chemical analysis shows that the dense bauxites contain Al_2O_3 75-85 % and silica 5% while pisolitic-oolitic bauxites contain Al_2O_3 60-65% and silica 13-15 %. Both the varieties contain TiO_2 in different proportions.

(C) Deposits of Liaoning area :

The Penshi (Benxi) - Fushien (Fuxian) G-bed area has two bauxite district. Penshi and Fuhsien which are located 65 km. SE and 260 km South - southwest of Shenyang respectively. Bauxite deposits in these two districts probably belong to the Kunghsien (Gongxian) Type and contains Al_2O_3 50-72%, Silica 7-30% Fe_2O_3 , 1.5 - 25% and TiO_2 2.2 - 3.1 %.

(D) Deposits of Ninghsia (Ningxia) Hui Autonomous Region :

Bauxite deposit in Jurassic Strata have been discovered near Chungwei (Zhohgwei), about 140 km. Southwest of Yinchuan, in the foothills of the Holan (Helan) Shan Range in the north western part of the region.

(E) Deposits in Inner Mongolian (Nei-Monggol) Autonomous Region :

Small bauxite deposit occur near Jungar, about 140 km. South-southwest of Muhehot (Hohhot)[14].

(F) Shantung (Shandong) Deposit :

Major bauxite deposits are found in the Tzupo (Zibo)

-Laiwu-G-Bed Area while smaller deposits are found to the west and South of it. The main bauxite deposits are located at Chinan (Jinan) and Tzupo, East and South East of Chinan respectively. Most deposits belong to the Hsiuwen (Xiwen) Type. In some deposits all the seven beds of bauxite and clay are present.

(G) Fukin (Fujian) Depost :

The changpu (Zhangpu) bauxite district is located about 270 km South-southwest of Fuchou (Fuzhou). Bauxite deposits occur in the Quemoy (Jinnen) Island off the coast, about 200 km South-Southwest of Fuchou (Fuzhou)[14].

(H) Honan (Henan) Deposit :

The Kunghsian (Gongxian) Tengfen (Dengfeng) G-Bed-Area is one of the largest bauxite areas in the country. According to Chinese source in 1980 proved reserves of 270 million (metric) tonnes were established. It embraces many bauxite districts notable among which are Kunghsien, Tengfeng, Leyang (Luoyang), Yiyang and Paofeng (Baofeng)[14].

(I) Kyangsi-Chuang (Guangxi-Zhuang) Autonomous Region

There is a large bauxite area in the central western part of this region which contains a deposit probably with A-Bed. During 1978 a very large bauxite deposit was discovered at Pingkuo the details of which are not available.

(J) Szechwan (Sichuean) Deposit :

Upper Permian bauxite deposit occur at Loshan, 130 km south of Hsuyung (Xuyong), about 300 km. South-Southwest of Kulin (Gulin) and about 350 km South-Southeast of Chengtu (Chengdu) respectively.

(K) Kweichow (Guizhou) Deposit :

There are two main bauxite areas in the central and central-western parts of Kweichow, Kueiyang (Guiyang) and Kaiyang areas[14].

(L) Yunnan Province : Major bauxite deposit are found in the Kunming G-Bed area, which include, deposits in Kunming districts, Chengkun (Chenggon) district, and those situated 40 km. northwest of Kunming respectively. Most deposits are of early Permian age and belong to the Hsiuwen (Xiuwen) type. They contain high grade ore. Some deposits, are found in the rocks of Lower Devonian and the Lower Carboniferous age. They contain geologically the oldest bauxites known in China. The assays of bauxites from the area show Al_2O_3 55-74%, SiO_2 2.30 - 18.47%, Fe_2O_3 5.33 - 14.42% and TiO_2 2.09 - 4.76 %.

5.8 SURINAME

Suriname stands eighth in the world production ranking with the production of 3,530,000 tonnes(1989). The bauxite deposits of Suriname can be divided into (I) low level and high level deposits. The former deposits occur as blankets on hillocks at elevations of about 50 m, while the latter deposits occur on plateaux at 300-600 m. elevation. The low level deposits are currently being worked. The important deposits of Suriname are described below :-

(i) Paranam-Onverdacht - Lelydorp belt[1]

This area situated along the Atlantic coast of Suriname is the best studied area, falls in the catchment area of Suriname Para and Saramacca rivers - Important deposits of the belt are as follows :-

(A) Onverdacht deposit :

This deposit situated in Para district, covers, 23 sq.km. area. The bauxite profile can be divided into (i) concretionary to nodular Zone (ii) cellular to boxwork zone (iii) layered zone (iv) plastic bauxite zone and bleached upper zone. On the whole, the bauxite deposit is stratiform and stratabound. The parent rock is completely altered to bauxite but is originally believed to be coarse arkosic sediments. The deposits are covered by 5-40 m thick clayey and sandy formations (Post Lower Oligocene). The deposit is owned by Billiton International and is expected to have reserves of 100 million tonnes.

(B) Other important deposits of this belt include Waterland, Accaribo, Topibo-de Vrijheed, Onoribo IV, Onoribo II, Kankantrie, Para, and Lelydorp -

(II) Moengo-Rieanau-Jones belt[1]

This belt lies in the eastern part of the Guiana Coastal plain. Bauxite forms caps on low hills. The principal deposits are located on Rieanau - Begi Gado-Jones hills in Marowijne district, Suriname. The bauxite capped plateaux in the belt cover 20 split over 25 hills. Important deposits include Moengo hill, Rieanau hill, Adjaema hills, Madoekas hill, Begi Gadohill, & Lobato hills. The bauxite zone is upto 14 m thick and is distinguished into two zones - i.e. upper massive zone and lower less compact and friable zone. The ore is mostly gibbsitic. The parent rock is absent as it is completely transformed into bauxite. The Moengo deposit is leased out to ALCOA. and has a reserve of 127 million tonnes distributed over 25 hills[1].

(III) Nassau Mountain belt :

This belt is situated in NE part of Suriname in Marowinjne district. There are four plateaux in the belt. The bauxite profile ranges in thickness from 0-10 m (average 2.5 m) and is white creamy, pink, red to brownish black in colour. Bauxite occurs in massive beds. The silica content is low while Al_2O_3 and Fe_2O_3 are highly variable. Mineralogically the bauxite is composed mainly of gibbsite, haematite and goethite. The parent rock is expected to be metaandesite, metabasalt and amphibolite of Paramaka Formation. A total reserves of 10.8 million tonnes are estimated in the area[1].

(IV) Bakhuis Mountain belt (Adampada-Kabalebo Area)

The prospective area is restricted to Bakhuis mountain horst. Important deposits of the belt are numbered as 1,2,8 and 10 areas which are located in Nickerie district. There are four large and a number of smaller deposits in the belt. The bauxite profile ranges from 1-22 m thick parent rock is anorthosite or pyroxene granulite. The ore has low

silica, Fe_2O_3 6-30 %, and Al_2O_3 54-58 %. The total proved reserves in the belt are estimated at 69.6 million tonnes[1].

5.9 YUGOSLAVIA

Yugoslavia stands ninth in world production ranking with a production of 3,252, 000 tonnes during the year 1989. Yugoslavia is rich in bauxites, Bauxite deposits occurs on the Istrian Peninsula, at Vlasemica & Niksieka Zupa Diasporic bauxite occur at Grebnicka planina Ariege type deposits occur in the Lika region[17].

Generally, Yugoslavia bauxite are boehmitic but the Eocene and Paleocene bauxite are mainly gibbsite-boehmitic and gibbsitic. Deposits of Grebnicka planina have diasporic composition. Most deposits are lenticular accompanied by small pocket deposits. Deep sinkhole deposits also occurs at some places[17].

Bauxite deposits occur in a 60 km wide belt along the entire Adriatic coast for a distance of about 560 km, in limestone pockets and lenses. Some are very deep and bauxites layers are folded into deep synclines that make mining difficult and uneconomical. Deposits are irregular fillings in karst depressions which are overlain by younger carbonate rocks. The formations enclosing the bauxite are deeply folded and bauxite extends to great depths. The age of the Yugoslavian bauxite ranges from Triassic to Eocene. Younger deposits contain mostly gibbsite and boehmite, and the older deposits are generally boehmitic. In some localities, diaspore is the major alumina mineral. (Patterson, 1967)[16]. Mostly the bauxite are of high to medium grade analysing 50-55 % Al_2O_3 and 1-8 % silica.

5.10 HUNGARY

Hungary stands tenth among world bauxite producing countries with the production of 2,700,000 tonnes in 1989. The main bauxite region is located in the Transdanubian hills. Nearly 500 bauxite deposits have been found in the country. Of these 57 % of the total bauxite occurs in large stratiform deposits, 23 % in lenticular, 10 % in sinkholes, 8 % in grabens and the remaining 2 % in canyon-like, blankets and

pocket deposits. The main deposits are situated near the Nyirad Halimba, Tharkut, Fenyofo, Bokonyoszlop, Iskaszentgyorgy, Gant and Nagyagyhaza localities[17, 18].

There bauxite bearing horizons can be distinguished in Hungary namely (a) Aptian - Albian (b) Turonian-Senonian and (c) Paleocene-Lower Eocene age[17]. The Bauxite deposits in Bakony and Vertes districts are associated with dolomite Karsts of Mesozoic, age. Mesozoic and Tertiary formations overlie these deposits [19]. Nagyegyhaza deposits are situated between lower Tilhonian and Lower Barremain Limestone[17].

The Hungarian bauxite deposits have very irregular shapes and occur in the form of lenses, pockets[20]. Sinkholes stratiform, blanket type[17]. The bauxite thickness is 5 to 30 m in stratiform and lenticular deposits but in sinkhole deposits it often reaches 60 to 90 m. The Bakony deposits are 6 - 10 m in thickness while the deposits at Vertes and Harsany are 2-33 m and 8 - 10m. thick respectively[20]. The Bauxite quality is variable. The ore analyses Al_2O_3 48 to 55 % and SiO_2 1-5 %[17, 20].

Bauxite of gibbsitic, boehmitic as well as diasporic composition are known in Hungary, kaolinite, heamatite goethite and anatase are the main accessory minerals. The deposits of Nyirad, Halimba Gant, and Harsany are pre-dominantly boehmitic (60-85 %) with varying quantity of hydrargillite, goethite, aluminite, kaolinite etc[17, 18, 20]. The Iskaszentgyorgy and Szoc deposits contain boehmite and gibbsite minerals. Gibbsite occurs predominant in the ore body (60-70 %) with Boehmite forming 18-20 %. The deposits at Harsany and Nezsa show gibbsite and diaspore, the former having 10 % and later show 50 - 70 %. Corundum is seen in many deposits which are regarded as of detrital origin. Silica occurs chiefly in kaolinite although free quartz and detrital silica are also noticeable.

Stratigraphically the deposits are found between Triassic and Tertiary formations and are of transported origin where gibbsite formed as a detrital material in an alkaline condition within karst depressions. Later, during diagenesis, the gibbsites were altered to boehmite and diaspore. Hungary is estimated to have 150 million tonnes of bauxite ore[20].

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