CHAPTER - II

CHAPTER 2

PREVIOUS WORK

General

Last 150 years have seen geologists deal with one or other aspect of the geology of Saurashtra peninsula. Broadly the following aspect of Saurashtra geology have received attention.

i) the Deccan Trap and its differentiates

ii) the Quaternary carbonate sands (miliolite) both coastal and inland,

iii) Juro-Cretaceous and Tertiary rocks and

iv) Tectonic frame work.

Initially the differentiates of Deccan Trap and the Quaternary carbonate sands attracted more attention of the geologists for their petrography and microfaunal interest respectively. The

tectonic framework and the Tertiary rocks have been studied in relevance to the oil exploration programme of O.N.G.C.

Fedden (1884) was the first to give an exhaustive account of the geology of Saurashtra as a whole. His monumental work even today provides an excellent source of information on almost all aspects of the Saurashtra geology.

In this chapter the author has endeavoured to summarise only such information which is directly or indirectly relevant to the present study. For this the author has taken into account the studies on Trap and its altered products i.e. bentonite, laterite and bauxite and briefly summarised the work done in Gujarat. A brief chronological account of the previous work is described in the following pages.

WYNNE (1872)

Wynne (1872), in his comprehensive account of the Geology of Kutch described bentonite and associated rocks of this region as "Volcanic Tertiaries" formed during the Eocene time.

FEDDEN (1884)

The first ever detailed and systematic geological account of the Saurashtra peninsula was given by Fedden (1884), and his work forms the basis for almost all the later works carried out in the peninsula.

FOOTE (1898)

Foote (1898), a state geologist of the then princely state of Baroda, reported a large number of acid and basic Trap-dykes

intruded into the main Trap-flows. He described the geology and mineral resources of the Amreli area and he more or less followed Fedden's work while giving his geological account.

ADYE (1914)

Adye (1914), clasified the dykes of Saurashtra into two groups.

i) older dykes of the lava period, forming low ridges, and studded with phenocrysts in a microlitic ground mass, and,

ii) post-flow dykes, forming massive high ridges, cutting the older dykes, and mostly holocrystalline and ophitic. He also mentioned the occurrence of a central type of volcanic activity.

DUBEY & BAJPAI (1937)

Dubey and Bajpai (1937) carried out radioactive element determinations of Deccan Basalts from western India. For Kathiawar basalts, they showed that there was not much variation in the radium and thorium contents in successive lava flows and in the younger dykes of the same period.

GUPTA AND MUKHERJEE (1938)

Gupta and Mukherjee in their classic report on "Geology of Gujarat and Rajputana", recorded the occurrence of bauxite for the first time near Kapadvanj and in Kheda district. They considered these laterite/bauxite as homotaxial with Ahmednagar sandstone series viz. Infratrappeans. The laterites in Saurashtra and Kutch in their opinion, were of late Eocene age and represented alterations of pyroclastic rocks of the Deccan

volcanic episode and their transported and reworked facies.

AUDEN (1949)

Auden (1949), described numerous dykes in the Kathiawar peninsula viz. radial dykes, dyke clusters, dyke networks and arcuate dykes. He studied the age and distribution pattern of the Deccan Trap dykes. For the dykes of Saurashtra, Gujarat and Konkan, he was of the view that some of them may have belonged to a post-lava hypabyssal phase.

ROY (1953)

Roy (1953), studied the bauxite deposits of Jamnagar district and summarised his observations by stating that high grade bauxite and bauxitic clays appeared to be of limited occurrence.

SAHASRABUDHE (1959)

Sahasrabudhe carried out a preliminary investigation of bauxite deposits of Kalyanpur Mahal, Jamnagar district. He regarded the bauxite deposits of Saurashtra and Kutch as "high alumina, low titania type" invariably having a brecciated or tuffaceous appearance. He further stated that bauxite deposits occured in the zones of laterite which separated the Deccan lava flows and overlying Tertiary sediments. He recognised three types of bauxite deposits in Gujarat. His type one are the bauxite that appear to have formed during the alteration of the pyroclastic facies of the Deccan lava flows. The second type of bauxite bearing laterites represent transported and reworked facies of the first type and show typical sedimentary depositional

features. The third type of bauxite deposits occur as elongated and funnel shaped irregular pockets resting over the uneven surfaces of limestone and clays filling depressions, formed during minor deformations in the Tertiary period.

WEST (1959)

West (1959) studied the Deccan Trap flows around Sagar, Madhya Pradesh, and concluded that the lavas were erupted through fissures now seen as dykes, and the major foci were off the west coast, in Saurashtra, and up the Tapti and Narmada valleys to the eastern Satpuras and beyond.

CHATTERJEE (1961)

Chatterjee (1961), while working on the magmatic differentiation of Deccan Traps has concluded that the fluidity of the Deccan Traps was due to the high content of iron, the chemical changes in the magma and accompanying gases.

SUBBARAO (1965 a,1965 b,1967)

Subbarao (1965 a) has concluded on the basis of petrography that the parental magma of the Deccan Trap region is tholeiitic in composition.

According to Subbarao (1965 b), the Deccan Trap igneous activity indicates only three phases; the volcanic, the major, and the minor intrusions, which can be further divided into different episodes. He has concluded that the minor intrusions had brought about a complete cessation of igneous activity in the Deccan Trap region.

Subbarao (1967) states that there was no renewed eruption of lava after the plutonic intrusions in the Deccan Traps.

SABOT JULLIET (1967)

Sabot Julliet (1967), a French geologist of Pechiney company, studied the Kutch bauxite from an economic point of view. In his report he mentioned that " the bauxite deposits of Kutch were formed by lateritization of basaltic rocks, like those of Saurashtra". He also opined that these laterites, formed by weathering, of the underlying Traps, must have been entirely ferruginous in nature when they were first formed. "Deferrification" by percolating waters is given as the explanation for the formation of bauxite patches in the laterite. The higher iron content in the lithomarge underlying the bauxite, in his view, was the result of impregnation of ferric oxide by the above percolating water whose dissolved iron was precipitated on encountering this clay zone.

SHAH (1974)

Shah (1974) in his investigations found that the Trap basalt cropped out as inliers near Nandana and Mewasa villages (Jamnagar district). Scattered horizons of bauxite in the laterite belt were seen by him. The bauxite deposits seen in the laterite belt, as well as those seen in pockets occured in the gradual slopes of the hillocks.

VYAS (1974)

Vyas in his investigation of the bauxite deposits of Jamnagar district found that traps and limestones were the dominant

country rocks covering major portions of the area. The bauxite deposits were invariably found associated with laterite. He reported that the bauxite horizon rested directly on the Deccan Traps, and at places were found covered by Gaj beds.

RAO (1976)

Rao (1976) published a report on "bauxite deposits of Gujarat state" and observed that bauxite deposits were very closely associated with laterite formations, within which they occured as seggregated pockets. The deposits of Saurashtra overlie either Trap or other sedimentary formations and occur on top of ridges and mounds. On the basis of field occurrence he classified bauxite deposits of Kutch into three types, (i) massive blanket type, (ii) bouldery type and (iii) earthy type. He opined that the bauxite deposits were formed from Deccan Trap as well as from supra-trappean sediments.

NENE et al (1976)

Nene et al (1976), studied the occurrence of bentonite deposits and their relation to the Deccan basalts. In their opinion, the bentonite deposits are Paloeocene in age while the Bauxite deposits are lower Tertiary in age. They suggested that majority of the Kutch bentonite was derived by the in-situ alteration of the Deccan Basalts.

PATEL (1978)

Patel (1978), studied the bentonite deposits of Kutch and stated that the Bentonite was formed by the in-situ alteration of the Deccan Trap basalts. He gave a detailed account of the genetic

relation between laterite and bentonite. According to him the bentonites of Kutch were of the grade suitable for oil-well drilling.

NAYAK (1979)

Nayak (1979) studied in detail the bauxite deposits of Kutch and Valsad districts with reference to its mode of occurrence, genesis and economic utility. Based on field studies he classified the bauxite deposits into five categories. According to him the bauxites were formed form the in-situ alteration of Deccan basalts and sedimentary clays. He stated that the bauxites of Kutch and Valsad districts can be utilised in metallurgical chemical, refractory and in abrasive industries.

SUKESHWALA (1981)

Sukeshwala (1981), concluded that the eruptive source regions of the Deccan magmas may be the two major lineaments, one along the E-W Satpura basin, and the other along the N-S Cambay basin with its extention in the south. He assumes that the first magma to erupt on a wider scale, forming the major part of the Deccan Traps, was the tholeiite, followed by rhyolite, in fairly large proportions; and the igneous activity closed with the final eruptive phase of minor quantities of the alkali olivine basalt magma and the carbonatite alkali magma, occuring as small plugs within the tholeiite.

DE (1981)

Based on the geochemical studies of different lava flows from Kutch and Saurashtra, De (1981) has suggested the hotspot or

mantle plume type of origin for the olivine nephelinite and alkali olivine nodules. The tholeiitic basalts were formed by quiet type of fissure eruption spread out over a very large area of peninsular India.

VALETON (1972,83)

Valeton studied the bauxite deposits of Mewasa (Jamnagar district) and gave a detailed account of its geochemistry. She has reported relict micro textures and micro structures of basalt (intergranular texture and columnar joints) in the bauxite deposits, and opined that the bauxite deposits were an in-situ alteration product of the basaltic lava flows.

SHUKLA et al(1983)

Shukla et al (1983), stated that the Gujarat bauxite deposits were seen in different geological environments. They also stated that bauxites were derived from a variety of rocks viz., basalt, shale, sandstone and granite, inland and coastal, in-situ and transported, and this was in contrast to other major segments of Western India where laterite included bauxite, and formed a thick capping over basalt at different elevations.

KAILA (1988)

Kaila (1988) carried out Deep Seismic Sounding (D.S.S.) studies in the Narmada-Tapti region and inferred a hidden Mesozoic Basin in the form of two grabens separated by a smaller horst. According to him this Mesozoic basin was deposited in a larger Mesozoic sea which extended from Sanawad-Mahan region through Saurashtra, Kutch upto Sind and Salt Range.

VAID (1987)

Vaid (1987) studied the laterite deposits of Kutch district and opined that the lateritic weathering profiles of Kutch have been developed by the in-situ alteration of the Deccan basalts.

PANDE et al (1988)

Pande at al carried out Argon dating of Alkali Basalts from Kutch Deccan Volcanic Province. According to them Ar-Ar ages for the alkali basalts show an age range between 64.4 ± 0.6 and 67.7 ± 0.7 Ma indicating a span of about 2 Ma for the alkaline magmatism in Kutch.

OZA (1993)

Oza (1993) studied the bauxite deposits of Jamnagar district Gujarat state, with reference to its mode of occurrence, geochemistry and minerology and postulated a genetic model for the bauxite deposits. According to him there had been both vertical and lateral differentiation of major elements within the in-situ weathering profiles developed over the Deccan Trap basalts, leading to the enrichment of Al, thus forming bauxite deposits. He stated that when these bauxite deposits are eroded and deposited, secondary deposits of bauxites are formed.