CHAPTER IV

DISCUSSION

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The anorthosites occurring in Sittampundi, Salem District, Tamil Nadu has invited the attention of several geologists from the time it was described in detail by Subramaniam in the years 1955 and 1956. He named it as Sittampundi complex and considers that the Sittampundi complex is a thoroughly metamorphosed, reconstituted series of ultrabasic rocks which forms a layered sequence of meta-anorthositic gneisses and eclogites with the former containing several layers of chromitites. Describing the geological setting of anorthositic and related rocks of Sittampundi complex, Subramaniam opines that the oldest rocks in the area are amphibolites, calciphyres and limestones, banded magnetite quartzite and dunites with related ultramafic rocks which may all be referable to Dharwar group. He is of the opinion tht the anorthosites and gabbroic rocks appear to have been emplaced in the form of a sheet during a period of quiescence as indicated by the formation of density stratified layers consequent on cooling. Subsequently, this layered complex has undergone profound metamorphic reconstitution and readjustment during two succeeding periods of regional deformation and metamorphism. The first period is related to regional migmatization and

the second period related to the intrusion of pink granite of batholithic dimension resulting in the forceful doming and tilting of other older rocks.

However, Naidu (1963) and Ramadurai et al (1975) strongly opposed the views of Subramaniam who mapped the anorthosites of Sittampundi with borders on both sides by continuous amphibolite layers. They emphasized the fact that these amphibolites are absent and the anorthosites is everywhere bordered by quartzo feldspathic hornblende biotite gneisses, while Subramaniam, compared the Sittampundi complex with that of the transition zone of Bushweld complex and the lower zone of the bay of Highland. complexes. He enumerates the following points:

1. The whole complex shows a striking resemblance to classical occurrences of gravity stratified sheets. The bulk chemistry of the various rocks of the complex bear a striking similarity of chemistry of rocks from other gravity stratified sheets.

2. The presence of several layers of chromitites within the anorthosites complex, proves conclusively their genetic relationship. The chemical composition of the chromite is similar to those of chromites of garvity stratified sheets.

To prove his point that the anorthosites are not the derivatives by metamorphism of limestone, he observes that it is difficult to get a section of impure limestone with a gradational range to give rise to a suite of rocks of varied composition like anorthosites and eclogites and it is difficult to visualise an extensive belt associated with eclogite and chromite formed with such a process. The chromites are beyond doubt igneous and their mineralogy does not indicate metamorphosed placers and finally in the region around Sittampundi there are several bands of crystalline limestone and marble, but none within the complex itself.

Naidu (1963) on the other hand regards the occurrence of anorthite gneisses at three localities namely Sittampundi, Palani and Madukkarai areas and is of the view that there is no layering of the rocks in Sittampundi as suggested by Subramaniam. His Presidential address delivered at the inaugural session of mineralogical society of India, 1959, was illustrated by six maps, 22 field photographs and 30 projections and micro slides and he concluded that the occurrence of anorthite gneisses and amphibolites which are extensive in Sittampundi and subordinate in Sankaridurg and occur as xenoliths

in Madukkarai and Palani. In all the three regions these rocks are associated with sediments of calcareous ferrginous, argillaceous nature which have been thermally metamorphosed into calc-silicate rocks. In his thought provoking special paper presented at the International Mineralogical Association meeting in the year 1963, he considers the Sittampundi area as consisting of rock units separated lastly in geological time namely the Dharwars, Peninsular gneisses, charnockites and post charnockitic granites formed during about 1000 m.y. He has used the analysis of garnet and amphibole of this end, the garnets are almandic in rocks associated with iron ores, pyropic in basic charnockite and grossularitic in anorthite gneisses. Regarding amphiboles, common hornblendes are present in peninsular gneisses, Hastingsite in basic charnockite and a highly aluminous calciferous amphibole in anorthosite gneisses His philosophical statement that from the account of mineralogy and petrology that the rocks of three different geological period cannot be connected together by crystallization-differentitaion process is worth pursuing. Though several studies have been undertaken including the geochemistry of the Sittampundi complex, the author is of the opinion that the real soultion to the Sittampundi complex can be arrived as only in the field study.

Much information on Archaean anorthosites have been recently published. The present author has reviewed the earlier works in the light of latest information available, Ashwal (1988) attempted to give a simple unified theory for the formation of anorthosites. According to him, there are 3 myths of anorthosite formation, the first myth is that there was a distinct anorthosite event in the late proterozoic period, the second myth is that the anorthosites are a major constituents of lower crust and the third myth is that the Archaean anorthosites are metamorphosed equivalents of layered mafic intrusion. Regarding the third myth, Ashwal states that the Archaean anorthosites are characterized by a distinctive feature that is absent in the layered anorthosite intrusion. Further, Archaean anorthosites are uniformly highly calcic in composition, i.e. An_{75}-An_{90}. In comparison, layered anorthosites have a varibale anorthite content from An_{50}-An_{80}. From the above observations, Ashwal proposes a simple unified theory that the anorthosite cumulate of plagioclase feldspars formed from mantle derived basaltic magmas.

Phinney et al (1988) discusses on the mega crysts of anorthosites and basalts and concludes that they can occur in a variety of geological setting.

According to him the cumulate crystal segregation in anorthositic to gabbroic complexes are associated with high grade metamorphic terrain containing marbles, quartzites, quartzo feldspathic gneisses and amphibolites.

Mallik (1989) found indirect clue for the probable concentration of platinum group of elements (PGE) in Sittampundi complex. The PGE is present as disseminations of palladium-platinum-nickel sulphide in chromitites and are mainly connected with the axial plane schistosity of F_2 fold. Chromite samples away from the hinge of F_2 fold are practically devoid of PGE. Therefore, it is inferred F_2 deformation is responsible for small scale dissemination of PGE by remobilization and crystallization. The author has made a special reference to chromite occurrence in the Sittampundi complex, armed with the excellent work of field observations by Sugavanam and Vidyadharan (1988) in parts of Tamil Nadu and Karnataka. The author has made the following field observations at Sittampundi.

1. Some of the chromite bands are not conformable with anorthosite bands (Refer Plate V, Fig.1).
2. Evidence for extensive tectonic reworking, multideformation and polymetamorphism are present.

3. Platinum group of minerals are present in chromite layers. Therefore, atleast some of the chromite band belong to ultramafic layers.

4. Corundum, some of them are semiprecious variety occur in Sittampundi.

5. Sapphirine occurs only as very thin layers.