Pyroxenites of Karapattu and Kunnathur Areas, Sevathur Complex, Tamilnadu, Southern India

LingaswamyVeeramalla*, K. Sreenu, Banothu Naveen and Rajendra Prasad Kanchi
Department of Geology, University College of Science, Osmania University, Hyderabad, India

Abstract:**The research areaKarapattu and Kunnathur villages are located NE part of the vellore district TamilNadu and comes under SevathurComplex, composed by pyroxenites, syenites and carbonatites. The Sevathur complex is occurred as ring and curve shaped structure. The aim of the study is to describe the petrographic features of pyroxenites,it includes field observations and megascopicproperties. Augite is the essential mineral formed as coarse grained euhedral to subhedral in shape, Enstatite is relatively less in weight percentage compared to augite and in some samplesan equal proportion of both Augite and Enstatite were observed. Karapattu and Kunnathur consist Pyroxenites and remaining places are covered by feldspar rich porphyry syenites are observed. The research area occupied about 20km^2.**

Keywords: Sevathur Complex, Karapattu, Pyroxenites and augite.

INTRODUCTION

The research work is investigating petrographic studies on Pyroxenites, Karapattu and Kunnathur of Krishanagiri and Vellore districts of Tamilnadu. A proposed area come under Sevathur complex and is situated in Moyar shear zone (MSZ) northern part of Southern Granulitic Terrain (SGT), Northern part comprises Peninsular Gneiss Complex, East, West and Southern parts are occupied by Charnokite Gneissic Complex. a brief discussion of regional geology of research area lithology and petrography of Pyroxenites from Karapattu, and Kunnathur.

LOCATION AND ACCESSIBILITY OF THE AREA

The research area is well connected through high way from Dharmapuri district via Puliyur, Pochampally, Garigepally, Samalpatti, Parasanur. Karapattu and Kunnathur areas are Easy to access by car and any other vehicles traversing towards East direction 40km away from Garigepally village, Karapattu and Kunnathur. The present study area falls within the Sevathur complex of Sothern Granulite Terrain. The main objective of the present research work is to evaluate the detailed petrographic, characteristic features of Pyroxenites of Sevathur Complex. The proposed research areas covered ~50 sq.km in the referenced Toposheet number 57L/10,57L/11and 57l/12.

CLIMATE AND VEGETATION

Eastern part of the district experiences hot climate and Westernport as a contrasting cold climate. The average normal rainfall is 840.78mm per annum. March - June is summer season. July - November is Rainy Season and between December - February winter prevails. 220.2 Rain fall, the total rainfall received during 2017 is 1130mm against the Normal rainfall of 830mm with average of 59 rainy days. The proposed research area is formed as pediplain, small mounds and valley fill formation from south to east direction.

GEOLOGICAL SETTING

The SGT was originally defined as the region south of the Palghat-Cauvery Shear Zone (PCSZ), with the blocks to the north up to the southern margin of the Dharwar Craton termed as the Northern Bock [M. Santhosh, 2017]. The southern granulitic terrain is one of the major crustal evolutions of southern peninsular India. The SGT is situated in southern part of peninsular India which is accumulated by different and distinct lithogical units of Archean and Neoproterozoic high-grade metamorphic and magmatic rocks. The important lithologies comprise tonalitic gneisses, migmatites with high-grade assemblages of garnet-bearing mafic granulites, charnockites, dis-membered mafic & ultramafic rocks, magnetite-rich quartzites and granitoids. Northern part

of the SGT is contact with Dharwar craton which comprises granites and green stone terrain.

The terrain has been divided into a number of distinct crustal blocks based on the structural and isotopic evolution from the north-south: (1) the Northern Block, (2) the Nilgiri Block, (3) the Salem–Madras Block, (4) the Cauvery Suture Zone (CSZ), (5) the Madurai Block, and (6) the Trivandrum Block [Naqvi and Rogers 1987; Santosh 1996; Bartlett et al. 1998; Chetty and Bhaskar Rao 2006; Ramakrishnan and Vaidyanathan 2008; Clark et al. 2009; Santosh et al. 2009; Plavsa et al. 2012; Collins et al. 2014].The study area comes under Dharmapuri Suture Rift Zone. They are emplaced within the Precambrian granulite terrains (Southern Ghats Terrain, SGT) along NE–SW trending fault systems [Grady, J.C., 1971; Randive, K et.al, 2020; Viladkar, S.G et.al., 1995].

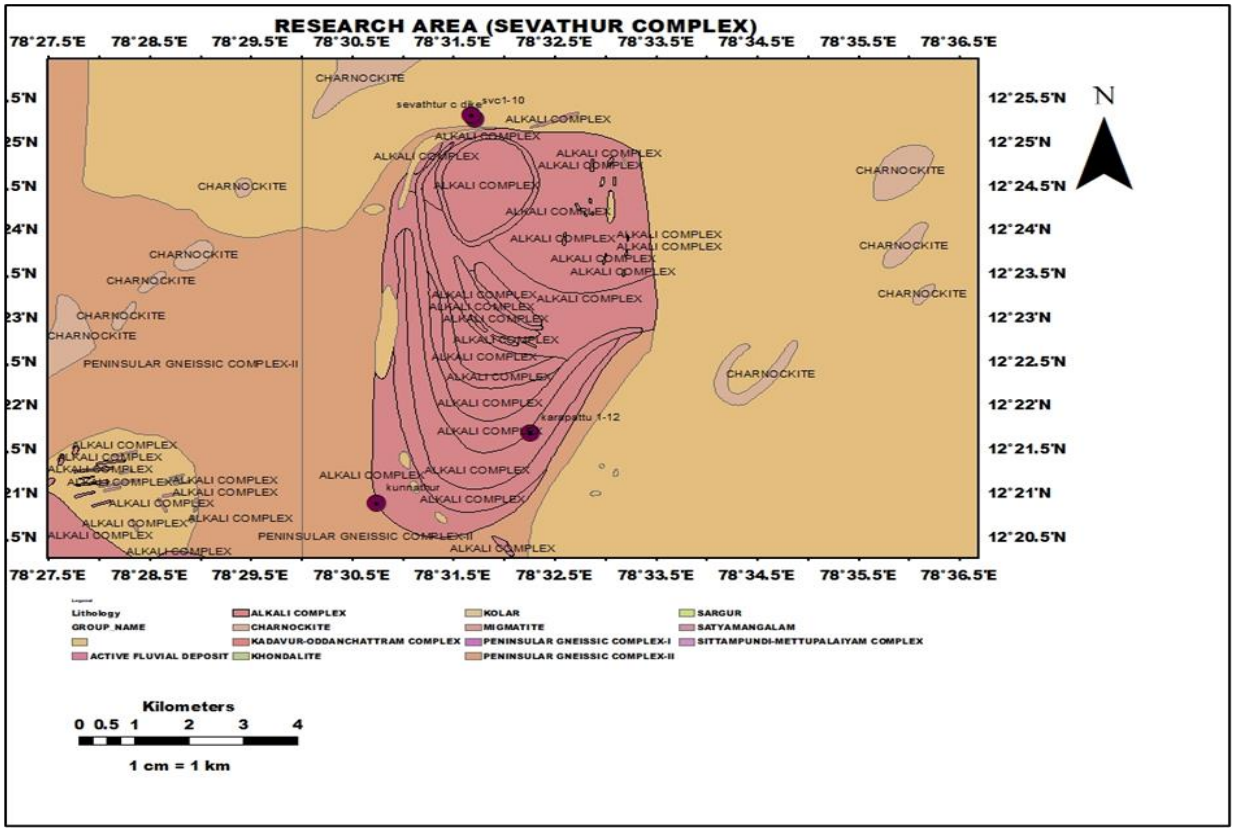

Figure :1 Geological map of study area [modified after by GSI/bhukosh]

PETROGRAPHY

The pyroxenites of Kunnthur are dark greyish to light green in colour, and coarse- to medium-grained. Under the microscope, grains showed primary magmatic cumulus textures with clinopyroxene (augite: 65–79%), amphiboles (11–20%), biotite (3–5%), K-feldspar (2–4%) and magnetite (3%) occurring as common minerals along with accessary minerals like, sphene, zircon and apatite up to 1% in the rocks. The pyroxenite samples of Karapattu and Kunnathur megascopically exhibits pale green to dark in colour, high specific gravity, white streak, massive form. Augite is the major mineral formed as coarse grained, euhedral to subhedral in shape, Enstatiteis relatively less in weight percentage compared to augite and in some samples, an equal proportion of both augite and enstatite were observed. Enstatite representing granulations of the phenocrysts of augite it occurred as an interstitial phase between pyroxene crystals and altered product of augite. In some samples, feldspars were seen in minor amounts along the grain boundaries of both augite and enstatite. Small number of ilmenites are brownish-red in colour, anhedral to subhedral in shape with minor inclusions of magnetite and greenish-coloured spinels were noticed.

Fihure:2a,b,c & d Pyroxenite outcrop of Karapattu and Kunnathur from Sevathur complex.

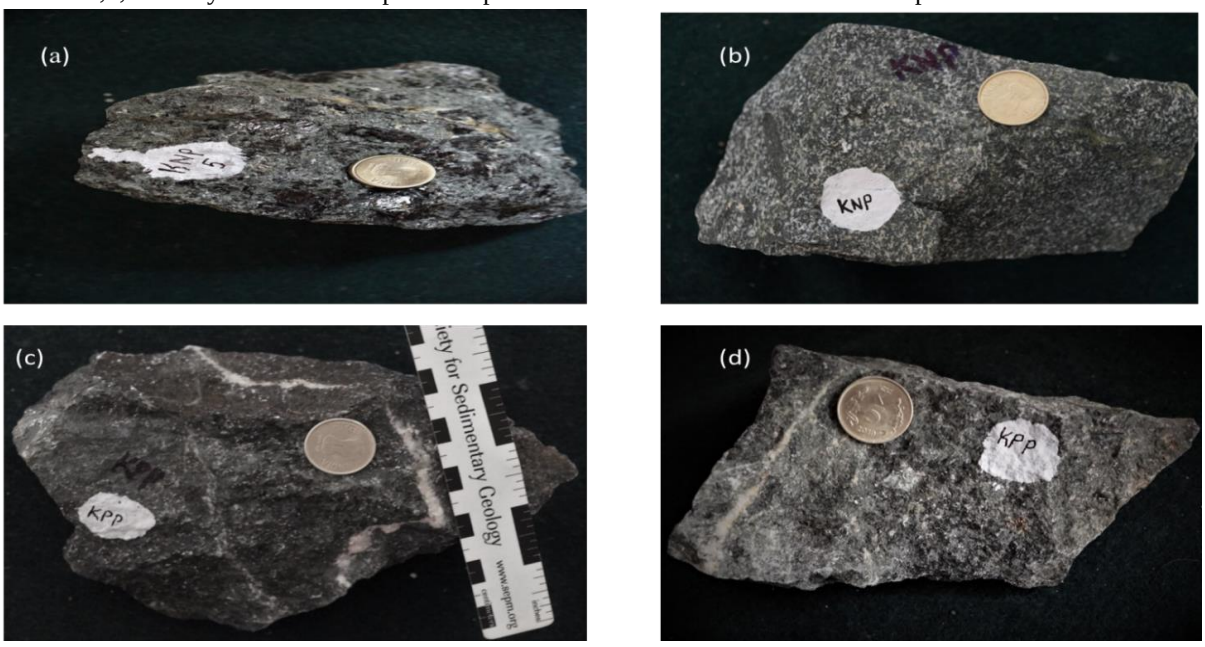

Figure:3a, b, c & d Megascopic photograph of Pyroxenites of Kunnathur and Karapattu

Table.1 Modal analysis of Pyroxenites of Karapattu and Kunnathur from Sevathur complex.

	1	2	3
	KNP-2	KNP-5	KPP
Augite	65	76	79
Amphibole	20	14	11
Biotite	5	3	4
K-Feldspar	4	2	2
Calcite	3	1	1
Apatite	1	1	0.5
Zircon	-	-	0.5
Sphene	-	-	1
Magnetite	2	3	1

KNP-Kunnathur, KPP-Karapattu

DISCUSSIONS

Pyroxenite is a coarse-grained ultramafic rock mainly composed by minerals like augite, hypersthene, diopside and enstatite along with accessory minerals chromite, garnet,
spinels, magnetite, scapolite and rutile. Pyroxenites are two types clino-pyroxenite and ortho-pyroxenite. Generally, pyroxenites are igneous type but some pyroxenites are occurring along contact zone formed by pyroxene-hornfels facies metamorphism. The modal analysis data reveals that mojar part of pyroxenites consist by cilnopyroxenes (65-79%) and amphibole constitute considerable amount(11-20%)andBiotite contain 3 to 5% with accessary minerals Calcite, Apatite, zircon and sphene. Pyroxenites might play an important role in basalt genesis [Lambart et al., 2016], either by contributing directly to the magma production, or indirectly as the result of reaction between peridotite and magma derived from partial melting of eclogite [Sobolev and others, 2007].

REFERENCE

[1] Bartlett, J.M., Dougherty-Page, J.S., Harris, N.B.W., Hawkesworth, C.J., Santosh, M., (1998). The application of single zircon evaporation and model Nd ages to the interpretation of polymetamorphic terrains: an example from the Proterozoic mobile belt of south India. Contributions to Mineralogy and Petrology 131, 181–195.

[2] Clark, C., Collins, A.S., Timms, N.E., Kinny, P.D., Chetty, T.R.K., Santosh, M., (2009). SHRIMP U-Pb age constraints on magmatism and high-grade metamorphism in the Salem Block, southern India Gondwana Research 16, 27-36.

[3] Chetty T. R.K & Y.J. Bhaskar Rao, (2006), The Cauvery Shear Zone, Southern Granulite Terrain, India: A crustal-scale flower structure, Gondwana Research,Volume 10, Issues 1–2, Pages 77-85.

[4] Collins, A. S., Clark, C., &Plavsa, D. (2014). Peninsular India in Gondwana: The tectonothermal evolution of the Southern Granulite Terrane and its Gondwana counter parts. Gondwana Research, 25, 190–203.

[5] Grady, J.C. Deep main faults in South India. *J. Geol. Soc. India* **1971**, *12*, 56–62.

[6] Lambart, S. L., and others, (2016), The role of pyroxenite in basalt genesis: Melt-PX, a melting parameterization for mantle pyroxenites between 0.9 and 5 GPa, Journal of Geophysical Research - Solid Earth 121, p. 5708–5735.

[7] Naqvi S.M & J. W. Rogers 1987. Precambrian Geology of India. viii + 233 pp. New York, Oxford: Clarendon Press; Oxford University Press. Price £40.00 (hardback). ISBN 0 19 503653 0.

[8] Plavsa, D., A. S. Collins, J. F. Foden, L. Kropinski, M. Santosh, T. R. K. Chetty, and C. Clark (2012), Delineating crustal domains in Peninsular India: Age and chemistry of orthopyroxene-bearing felsic gneisses in the Madurai Block, *Precambrian Res.*, **198–199**, 77– 93.

[9] Ramakrishnan and Vaidyanathan, (2008), Geology of India, vol. 1, Geological Society of India, 556 p.

[10] Randive, K.; Meshram, T. An Overview of the carbonatites from the Indian subcontinent. *Open Geosci.* **2020**, *12*, 85–116.

[11] Santosh, M., (1996). The Trivandrum and Nagercoil granulite blocks. In: Santosh, M., Yoshida, M. (Eds.), The Archaean and Proterozoic terrains in southern India within East Gondwana. Gondwana Research Group, Memoir. 3, pp. 243–277.

[12] Santosh, M., Maruyama, S., and Sato, K., (2009), Anatomy of a Cambrian suture in Gondwana: Pacific-type orogeny in southern India: Gondwana Research, v. 16, p. 321-341.

[13] Santosh, M., Hu, C.-N., He, X.-F., Li, S.-S., Tsunogae, T., Shaji, E., Indu, G., (2017). Neoproterozoic arc magmatism in the southern Madurai Block, India: Subduction, relamination, continental outbuilding, and the growth of Gondwana. Gondwana Research, 45: 1–42.

[14] Sobolev, A. V., and others, 2007, The amount of recycled crust in sources of mantle-derived melts, Science 316, p. 412-417 (abstract) Retrieved on 6 October 2007.

[15] Viladkar, S.G.; Subramanian, V (1995). Mineralogy and geochemistry of the carbonatites of the Sevathur and Samalpatti complexes, Tamil Nadu. *J. Geol. Soc. India*, *45*, 505–517.