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MINERAL CHEMISTRY OF MULAKKADU SYENITES OF PAKKANADU – MULAKKADU ALKALINE COMPLEX, TAMIL NADU, SOUTHERN INDIA

K. Rajendra Prasad[1*], M. Srinivas[1], P R C Phani[2], Sreenu Kunsudoth[1], S. Amarendhar[1]
[1]*Department of Geology, University College of Science, Osmania University, Hyderabad*
[2]*Cyient Limited, Office#6, NSL-SEZ Arena Town Centre, Uppal, Hyderabad*
Email: rpkanchi143@gmail.com

Abstract

This paper deals with mineral chemistry of syenites from the Pakkanadu-Mulakkadu Alkaline Complex (PMAC) in Salem district of Tamil Nadu. The PMAC is comprised of several rock types in which syenites are important members. The syenites well-exposed at Mulakkadu are massive, leucocratic, medium to coarse grained and K-feldspar rich. The modal mineralogy includes K-feldspar (73- 85 % by vol), clinopyroxene (2.35- 7.93%), amphibole (2.34- 8.57%) as major minerals with mica (0.5- 8%) quartz (1.0%), magnetite (1- 5%), garnet (0.5-2.5 %) and sphene (0.5- 2%) as accessories. The subhedral amphiboles are calcic with low silica and alkalies, typical of magmatic amphiboles. They are primary and represent an early magmatic liquidus phase. They have Ca_B e"1.50, $(Na+K)_A$ e" 0.5 and Tid"0.5 and are classified as hastingsites. The subhedral to anhedral micas are classified as homogenous biotite with a restricted compositional variation in X_{Fe} and X_{Mg} values. The peraluminous biotites are calc-alkaline akin to orogenic subduction. A wide variation in Al^{iv} content is attributed to silica activity, temperature and total pressure. Biotites show low MgO/FeO ratio (0.34 -0.37) implying an evolved melt and least magmatically fractionationed. The euhedral to subhedral pyroxenes (cpx) are associated with amphiboles and their textures suggest slow cooling. The pyroxenes are classified as Ca-rich varieties with non-aluminous character consistent with low Al_2O_3 (1.62-2.37 wt.%) and low Mg# (0.483- 0.524). Rapid crystal growth is a stimulus for Al substitution while Ti content is dependent on bulk rock chemistry. The garnets are predominantly of andradite variety, showing euhedral rhomb dodecahedral crystal habit. The andradites are rich in CaO (29.67- 30.22 wt %), Al_2O_3 (6.85- 7.27 wt %) and FeO (21.52- 21.89 wt %).

Keywords: Syenite, Mineral chemistry, Alkaline complex, Petrogenesis, Mulakkadu.