

Mineralogical and geochemical characterization of quartz diorite around Ago-Iwoye, Southwestern Nigeria

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The mineralogical and geochemical characteristics of quartz diorite in Ago – Iwoye area, southwestern Nigeria were used to evaluate its petrogenesis. Mineralogical analysis was carried out using petrography, Scanning Electron Microscopy (SEM) and Electron Probe Micro Analysis (EPMA) while geochemical characterization was carried out using Inductively Couple Plasma Mass Spectrometry (ICPMS) and data was interpreted using appropriate geochemical plots. Mineralogy results revealed major minerals are biotite, plagioclase, quartz and amphibole while accessory minerals are allanite, apatite, zircon, ilmenite and Ti-rich magnetite. EPMA results and discrimination plots revealed the biotites are phlogopitic with Mg# values of 0.52-0.57 which is indicative of slightly fractionated magma and the amphiboles are calcic and of igneous origin with composition varying from hornblende to paragsite/tschemarkite. Geochemical analysis result revealed SiO₂, Al₂O₃, Fe₂O₃, CaO, MgO Na₂O and K₂O ranged 59.5 – 61.3%, 17.05 -17.95%, 6.16 – 7.11%, 5.64 – 6.24%, 2.83 – 3.42%, 4.08 – 4.22% respectively with ASI of 0.89-0.92. Trace elemental concentration are while ΣLow REE, ΣMid REE, ΣHigh REE (ppm) ranged 74.92 – 83.20, 8.12 – 10.09 and 5.18 – 7.57 respectively indicating ΣLow REE > ΣMid REE > ΣHigh REE. Geochemical characterization reveals the quartz diorites are metaluminous, low K, sub-alkaline to calc-alkaline, display chemical composition typical of I-type granites with high Ba-Sr enrichment. The rocks plots within the calc-alkaline origin field and chondrite normalized REE patterns revealed small negative Eu anomalies (0.55 – 0.97) while Elemental ratios and high Mg# values, suggest an origin through dehydration melting of alkaline mafic lower crustal source rocks.. Geothermobarometric considerations revealed the amphiboles crystallized at 754-806°C and pressures of 138-303MPa and amphibole chemistry also revealed a subalkaline affinity for the magma. In conclusion, the quartz diorite of the Ago – Iwoye area are characterized by enrichment of LREE relative to HREE and slightly negative Eu anomaly with signatures suggesting low fractionation in the granitoids.