Magma Source and Evolution of the Late Neoproterozoic Gabbros in the Arabian-Nubian Shield: Geochemical, Mineralogical and Sr–Nd Isotopic Constraints

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The present study deals with geology, whole rock chemistry, mineral chemistry, ore mineralogy and Nd-Sr isotopes of gabbroic rocks west of Marsa Alam at Wadi Samadai and Wadi Tundeba (south Eastern Desert) and Wadi Baraq (South Sinai), compared with some gabbros in Arabian shield. The gabbros and diorites in Arabian shield occur in the three type of intrusions and are classified into Pre-orogenic, syn-orogenic and the post-orogenic. The isotopic dating of different types indicates that the Pre-orogenic intrusions range from 1000 to 700 Ma and the Syn-orogenic range from 700 to 620 Ma. The post orogenic intrusions have the age between 620 and 550 Ma. The studied gabbros at Samadi – Tundeba gabbroic intrusion form small five igneous bodies and made up of hornblende gabbro, fine quartz hornblende gabbro and diorite. Enclaves of gabbros and diorites are hosted in Samadia granite and concentrated marginally. The leuco and melanocratic varities sometimes showing fragmentation and irregular distribution which may indicate irregular fractionations, magma mixing and the tectonic emplacement take place during fractionations. Field aspects may indicate that the parent gabbroic magma are modified into hornblende gabbro and diorite through assimilation- magma mixing and later by thermal metamorphism due to Samadia granite intrusion. The Baraq gabbros in south Sinai intruded into granodiorites (older granites) and intruded by muscovite biotite granites (Iqna granites) and Iqna porphyritic rhyodacites. Ore mineralogy and EDAX studies of these gabbroic bodies indicate that Fe-Ti oxides and minor Ni-Cu- Fe sulfides are found. The ore mineralogy in Baraq gabbros are mainly ilmenite, composite grains of ilmenite and magnetite, trellis of ilmenite- magnetite and minor pyrite, whereas the Samadia gabbros are mainly magnetite and ilmenite.

Geochemically, the rocks were derived from tholeiitic magma with minor calc alkaline affinity and originated in island arc stage. Plagioclases range in composition from oligoclase to bytownite. The amphiboles are present and range in composition from hornblende to pargasitic hornblende. The pyroxenes are diopside to augite in composition. The biotites from diorite are Mg biotite whereas those from hornblende gabbro are Fe-Mg biotites and both derived from calc-alkaline magma.

The Rb-Sr isochron gave an age of 674±6 Ma with an initial 87Sr/86Sr ratio of 0.70367 ± 0.000175, MSWD=7.22 for the of Baraq gabbros. The rocks have low 87Sr/86Sr initial ratio range from 0.703542 to 0.704266 and epsilon Sr range from -2.3 to 8. The initial 143Nd/144Nd ratios range from 0.512578 to 0.512696 and positive Nd epsilon values (1.29- 6.04). The Rb-Sr isochron gave an age of 570.8±7 Ma with an initial 87Sr/86Sr ratio of 0.70276 ± 0.000148, MSWD=0.34 for the Samadia gabbros. The rocks have low 87Sr/86Sr initial ratio range from 0.7027237 to 0.7027928 and epsilon Sr range from -15.12065. The initial 143Nd/144Nd ratios range from 0.5119768 to 0.5121292 and positive Nd epsilon values (0.004- 4.23) indicating a mantle origin.

**Key words**: Arabian- Nubian shield, Neoproterozoic gabbros, Sr- Nd isotopes, geochemistry, mineral chemistry

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