Geochemical characteristics of metabasites from the Chongwe area, southern Irumide Belt, Zambia

F. TEMBO[1], B. DE WAELE[2], T. JOHN[3] and C. KATONGO[1]

[1]Department of Geology, University of Zambia, PO BOX 32379, Lusaka, Zambia
[2]CGA-Unit, Department of Geology, University of Zambia, PO BOX 32379, Lusaka, Zambia
[3]Institut für Geowissenschaften der Universität Kiel, Germany

The Mesoproterozoic Irumide Belt is a complex metamorphic terrane covering most of eastern Zambia. In the south, the Irumide Terrane consists of sedimentary and igneous rocks, which have been metamorphosed to amphibolite grade. Locally, high-pressure, granulite-facies metamorphic rocks are preserved. High-strain zones characterised by mylonitic rocks commonly separate the lithotectonic units in the southern Irumide Belt. Within the belt, mafic and intermediate orthogneisses, amphibolites, metagabbros and ultramafic rocks form an important lithological unit. The gneisses and amphibolites occur as concordant units, which show various degrees of deformation. The gneisses are typically banded, consisting of amphibolite bands (plagioclase + garnet + hornblende), alternating with plagioclase + garnet + quartz bands of various scale and thickness. Amphibolites are fine- to medium- grained, consisting of hornblende + plagioclase + quartz + garnet and show various degrees of alteration to actinolite + chlorite + talc schists. The gabbroic suite consists of medium- to coarse-grained gabbros, pyroxenites and peridotites.

Major and trace element characteristics indicate that the mafic rocks are tholeiitic, characterised by high Ti/Zr, Zr/Nb and low Zr/Y ratios. The mafic rocks can be subdivided into two groups on the basis of TiO_2/MnO, Zr/Nb and Nb/Ta ratios. Metagabbros and amphibolites associated with ultramafic intrusives have low Nb/Zr and Nb/Ta ratios, typical of calc-alkaline basalts, whilst amphibolites from the Chongwe-Chiawa area have low Nb/Zr and Nb/Ta ratios, comparable to MORB tholeiite. When compared to MORB, the least fractionated rocks are enriched in the LFSE and depleted in HFSE. Apart from weakly developed anomalies in a few samples, the majority exhibits no Nb anomalies. The rocks exhibit flat REE patterns and fractionation of HREE relative to LREE (LaN/YbN *ca* 1.5-4).

Tectonic discrimination diagrams employing stable trace and minor elements suggest that the amphibolites have P-MORB and N-MORB characteristics, whilst the metagabbros and amphibolites from Paulwi Hill have calc-alkaline affinities.

The geochemical characteristics and associated lithologies of the Chongwe metabasites are comparable with the range in composition found in the Mesoproterozoic Chewore ophiolitic complex described in northern Zimbabwe, for which a marginal-basin environment of formation has been proposed (Oliver *et. al.*, 1998). The location of the Chewore complex immediately south of the Chongwe area, suggests that the rocks belong to the same complex, thus confirming models of continental breakup during the Mesoproterozoic.

References

Oliver, G.J.H., Johnson, S.P., Williams, I.S., Herd, D.A., 1998. Geology 26, 571–573.

The geotechnical aspects of Tshikondeni Coal Mine

F.E. THABO and J.H. SULLIVAN

Iscor Tshikondeni Coal Mine, PO Box 50, Tshikondeni 0959, South Africa

Tshikondeni Coal Mine area was tectonically active during various geological periods. The mine is underlain by rocks of the east-northeast trending, high-grade metamorphic Proterozoic Limpopo Mobile Belt (Sullivan *et al.*, 1994). The north-eastern margin of the Kaapvaal Craton was downfaulted into a graben-type structure into which the pre-Karoo Soutpansberg Group was deposited. This faulting continued during the deposition of the Karoo Supergroup sediments and was again reactivated in the post Karoo times, resulting in a very complex structural setting (Truswell, 1977). Two main fault systems have been identified, one trending east-northeast and the other north-northwest. The Karoo Supergroup was faulted into a series of horst-and-graben blocks with displacements exceeding 1000 m in some cases. The faults have a listric nature and are all normal faults, which is an indication of extensional tectonics. The blocks between faults are tilted and the dip of the strata varies between 2° and 18°, but increases to 22° near the faults.

The mine is situated in the east-northeast trending graben structure. Step-faults occur along the perimeter of the graben structure. These have maximum displacements of ~300 m on the northern side, while faults with a throw of up to 50 m occur along the southern boundary. This graben is cut by secondary