Opaque Mineralogy of Some Pillowed Lavas in the Egyptian Shield

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Petrography and chemistry of opaque minerals from seven selected pillow metavolcanic occurrences in the Egyptian Shield have been studied for the purpose of identifying their textural and compositional variations with metamorphism. These rocks are affected by both ocean-floor and regional metamorphism of greenschist to greenschist-amphibolite transition facies.

Ilmenite is the main opaque mineral in most of the investigated rocks except those of the greenschist facies metamorphism where it is completely altered to titanite. Morphology and textural relations indicate the late crystallizing igneous origin of ilmenite. The well preserved ilmenite exsolution lamellae in titanite demonstrate the stability of ilmenite relative to titanomagnetite in such conditions. Unlike igneous ilmenite, the investigated rocks contain ilmenite enriched in MnO (1.7 - 9.5 wt%) and depleted in MgO (<0.3 wt%). The ilmenite exsolution lamellae which are preserved in titanite have MnO wt% ranging between 8.7 and 9.5 wt%. Discrete ilmenite grains found in samples where titanomagnetite is completely altered have MnO ranging from 5.5 wt% to 6.7 wt%. However, the ilmenite grains of samples where titanomagnetite is still preserved have low amounts of MnO (1.7 wt%-1.9 wt%). This suggests that the presence or absence of titanomagnetite plays an important role in determining the Mn-enrichment of ilmenite. Oxygen fugacity seems also important, where ilmenite containing hematite exsolution bodies and rutile lenses are less enriched in Mn relative to ilmenite free of hematite.

Similar to ilmenite, the metamorphosed ferrit-chromite margins are rich in Mn and depleted in Mg relative to their unaltered cores.