PHASE RELATIONS AND STABILITY FIELD OF OSUMILITE AND SPINEL IN GRANULITE GRADE METAPELITES AT HIGH OXYGEN FUGACITY: A NEW EXPERIMENTAL DATA

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Osumilite and spinel pair had been found to occur in many of the natural metapelites both in very high temperature contact aureoles and regional granulite terrain. The petrogenetic grids, so far constrained from different experimental studies didn't consider this pair as stable. Apart from the pressure, temperature, bulk composition and water activity, oxygen fugacity is considered to be an important variable for the iron-bearing system that controls the mineralogical evolution of the terrain. It is known that the change of fO2 causes significant change in the topology of the grid. So far experiments were carried out in KFMASH system at low fO2~QFM buffer. But many of the natural occurrences are suggestive of high fO2 near that of the hematite-magnetite buffer. The main findings of the stability field of osumilite+spinel from the present experiments carried out in KFMASH system with high Mg-Al bulk composition at hematite-magnetite buffer condition are as follows.Osumilite (XMg~0.95) and spinel (XMg=0.70-0.75) appear directly through melting of biotite-sillimanite-quartz at T=850C and P8.5Kbar and coexists between 7.5 Kbar and 8.5 Kbar till 1000C with a melt of granitic composition. Stability of garnet+osumilite, commonly encountered at low fO2, is not permitted at high fO2. Instead, cordierite+osumilite and spinel+osumilite become stable. This well-defined field of osumilite+spinel gives way to orthopyroxene+sillimanite at P8.5 Kbar and sapphirine+orthopyroxene at T1000C. Like the garnet-osumilite field at low fO2, the spinel-osumilite field at high fO2 is restricted to P8.5 Kbar. Hence, this pair is expected to form only during low-to-medium pressure-high temperature at high fO2.