Petrology and metamorphism of pelitic rocks from the internal zone of the Pan-African Lufilian belt, Copperbelt, Zambia

*Kabangu Grace Sakuwaha[1], Toru Takeshita[1]

1. Hokkaido Univ.

The Luswishi Dome located in the Domes region of the Central African Lufilian Copperbelt belt consists of Neoproterozoic metasedimentary rocks explored for their potential to host copper sulphide minerals (Turlin et al., 2016). The region has undergone Pan-African metamorphism interpreted to be associated with late stages of Gondwana assembly during the late Proterozoic to Cambrian (Eglinger et al., 2016). This study examines the conditions of metamorphism in this area based on drill core logging and thermobarometry to help better resolve their P-T-d history in order to contribute to an improved understanding of the tectonothermal evolution of the Domes region. We present new petrologic and geothermobarometric data as well as phase equilibria models constructed for garnet-bearing pelitic schists from the Dome’ s region (Luswishi, Zambia). The studied samples consist of garnet-plagioclase-kyanite or garnet-amphibole porphyroblasts in a foliated matrix of biotite-muscovite-plagioclase-quartz-ilmenite. Amphibole compositions lie in the field of pargasite and plagioclase is mainly andesine with X_{An}=30-50 (in amphibole-absent schists), or oligoclase with X_{An} =10-30 (in amphibole-rich schists). Garnets are chemically zoned with almandine and pyrope increasing from core to rim whereas sperssartine and grossular decrease from core to rim with an upturn at the rim suggesting that the zoning is as a result of growth processes which, have been slightly affected by subsequent diffusion on the rims where the zoning is reversed. A decrease of the Fe/(Fe+Mg) from core to rim in garnet zoning also indicates an increase in the temperature during the garnet growth for the modelled samples. P-T calculations were conducted by inverse modelling using mineral compositions obtained by EPMA and application of the garnet-plagioclase-biotite-muscovite thermometer and GASP barometers. Pseudosections have been constructed in the MnNCKFMASHTO system with SiO2 and H2O saturation using Perple_x 6.8.6 (Connolly, 2005), updated March, 2019 and the updated 2011 version of internally-consistent thermodynamic database (Holland & Powell, 2011). The results from the two methods are consistent with each other, with peak conditions at 500-600˚C and 5.5-9 Kbar. Textural relationships from thin section analysis also suggest a prograde metamorphic path accompanied by at least 3 distinct deformation phases with episodes of crystallization and deformation as determined from the porphyroblast-matrix microstructural relationships. Features of both ductile and brittle deformation are preserved in some samples, some of which also show overprinting by an episode of metasomatism and retrograde metamorphism.

Keywords: Copperbelt, Metamorphism, Thermobarometry, Pseudosections

