P-T-t-D EVOLUTION OF HIGH-PRESSURE BARROVIAN-TYPE METAPELITES IN THE IMJINGANG BELT, KOREA

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The east-trending Imjingang belt, a candidate for eastward extension of the Dabie-Sulu UHP belt, consists of Barrovian-type metapelites, ranging from garnet through staurolite to kyanite zones, and the structurally lower calc-silicate rocks. The Imjingang belt records three major episodes of deformation: (1) initial contractional deformation (D_{n-1}); (2) penetrative deformation (D_n) producing major foliation; and (3) extensional ductile shearing. Mineral parageneses and reactions producing porphyroblastic and accessory minerals in the metapelites were investigated for delineating quantitatively the collision process. Metapelites experienced a clockwise P-T evolution characterized by: (1) prograde garnet formation associated with crustal thickening; and (2) staurolite growth during decompression. Both biotite and garnet have grown at two different stages. Biotite poikiloblasts started to form between D_{n-1} and D_n, but inclusion-free margins grew during D_n. Initial growth of poikiloblastic garnet was post-D_{n-1}, and took place predominantly during D_n. The inclusion-poor garnet overgrowth at the expense of biotite was post-D_n. Progressive rimward change of inclusion minerals within garnet, from ilmenite to rutile, is attributed to the burial of pelites. Inclusion mineral assemblages and compositions of staurolite suggest that two different reactions were responsible for the staurolite growth during a decompressional stage; staurolite in the staurolite zone was produced by the well-known reaction, Grt + Chl + Ms = St + Bt + Qtz + H_2O, whereas large staurolite (up to 6 cm) in the kyanite zone was formed by the hydration reaction, Grt + Ky ± Ms + H_2O = St ± Bt + Qtz. Kyanite, one of the reactant phases of the hydration reaction, was produced at the expense of garnet and chlorite prior to the formation of staurolite. Absence of epidote-group minerals in the matrix together with their common presence within kyanite suggests that fluids necessary for the growth of staurolite were probably derived from the breakdown reactions of (clino)zoisite and / or mica. This fluid generation may also account for the presence of monazite and xenotime, occurring exclusively in the kyanite zone and replacing allanite-(clino)zoisite aggregates. The paragenetic reversal between staurolite and kyanite compared to typical Barrovian-type suggests that the prograde P-T segment reaches a maximum pressure of greater than 11 kbar on the basis of petrogenetic grids using the KFMASH model system. In contrast, occurrences of rare sillimanite and minor andalusite suggest that exhumation switched from an isothermal decompression to isobaric cooling path at ca. 6 kbar and 600 - 650 °C.