モンゴル・アルタイ地域に認められる異なる変成履歴

Contrasting pressure-temperature records from the Altai Range, Mongolia; constraints from multiple growth of garnet, aluminosilicates and monazite

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Pelitic gneisses from the western Mongolian Altai Range of the Central Asian Orogenic Belt exhibit multistage aluminosilicate formation and various chemical zoning patterns in garnet. The studied pelitic rocks are divided into four types; garnet-kyanite-biotite gneiss, garnet-cordierite-biotite gneiss, garnet-staurolite-sillimanite-biotite gneiss, and garnet-staurolite-kyanite-biotite gneiss. The former two gneisses contain kyanite in the matrix and sillimanite inclusions in garnet. The Ca concentrations in garnet from the garnet-kyanite-biotite gneiss increase and those from garnet-cordierite-biotite gneiss decrease from centre to inner rim in the core. In garnet-staurolite-sillimanite-biotite gneiss, and garnet-staurolite-kyanite-biotite gneiss, sillimanite or kyanite occurs in the matrix, respectively, and both have kyanite inclusions in garnet. The garnet has homogeneous high-Ca core part, and the mantles are characterized by low-Ca. Monazite U-Th-Pb dating for the studied samples shows the bimodal ages; c. 360 Ma and c. 260 Ma. Combining the microstructural information, thermodynamic calculations, and geochronology suggests all rock types experienced compression at c. 360 Ma, but this compression occurred at different crustal levels. The garnet-kyanite-biotite gneiss and garnet core in garnet-cordierite-biotite gneiss represent compression at low-pressure conditions (~5.2 to 7.2 kbar) under moderate-temperature conditions (~620-660 C). In contrast, the garnet cores in garnet-staurolite-sillimanite-biotite and garnet-staurolite-kyanite-biotite gneisses were formed during compression at higher pressure conditions (~7.0 to 8.9 kbar at ~600-640 C). It is still obscure why the different thermal gradients existed during the compression but it is likely due to presence of ridge subduction in the Altai Range reported by several workers. The subducting ridge could supply heat to the accretionary wedge and produced new geotherm. The difference in thermal gradients observed in this study might be due to variations in thermal regimes from the subducting ridge, which has an important role in developing the variations in prograde pressure-temperature paths during burial of the accretionary wedge. Garnet mantles and the matrix mineral assemblages in three rock types except garnet-kyanite-biotite gneiss were recrystallized during the c. 260 Ma event characterized by amphibolite-facies metamorphism with a metamorphic thermal gradient of ~25

C/km, which might be caused by collision-related granitic activity and re-equilibrium at middle crustal depths. This study also suggests monazite U–Th–Pb dating combined with the occurrence, texture, and chemistry of associated mineral phases in amphibolite-facies rocks will allow us to recognize multiple events and the equilibrium phases during each event.

キーワード：ザクロ石、アルミノ珪酸塩鉱物、モナズ石、変成履歴、アルタイ、モンゴル
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