

Provenance of the detrital heavy minerals in the sandstone of the Yezo Group in central Hokkaido, northern Japan

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The characteristics of chemical compositions in individual mineral species can directly indicate the source rock characteristics. The Yezo Group, Cretaceous forearc basin sediments in the Sorachi-Yezo belt in central Hokkaido mainly consists of terrigenous sedimentary rocks (Kiminami et al., 1986). Previous studies on sedimentary petrology reveal that the hinterland consisted of various rock assemblages, such as granites, volcanic rocks and sedimentary rocks (ex. Matsumoto and Okada, 1971; Kiminami et al., 1992), whereas study on chemical composition of heavy minerals has mainly been investigated on detrital chromian spinels related to the formation of ophiolite belts and serpentine activity (ex. Nanayama, 1997). In this study, the analysis for chemical composition of detrital garnets and clinopyroxenes in the sandstones of the Yezo Group is carried out using by EDS. The sandstone samples for this study were collected from the Ashibetsu and Hidaka areas, central Hokkaido.

As a result, the composition of detrital clinopyroxene is characterized by low Ti (<0.3) and low Ca + Na. Though the detrital garnets show significant variations in composition, low-grandite pyrope-almandine garnets generally predominate throughout the Yezo Group. Almandine garnets with pyrope end-member prevail in the lower part of the Yezo Group, though a significant amount of grandite-spessartine and grandite-almandine garnets are included in the lower part.

The above chemical composition of detrital clinopyroxene and garnets in the sediments allow us to characterize the corresponding provenance. The detrital clinopyroxenes show the derivation from penecontemporaneous volcanic belt including calc-alkaline, orogenic basalt and andesite, for example, the Reibun ? Kabato Belt located to the west of the sedimentary basin. The variation of the detrital garnet species suggests complicated source rock assemblage that is correlative to the rock types in the Oshima Belt. Also low-grandite pyrope-almandine garnets in the Yezo Group are probably correlated to those of the detrital garnet grains included in the Jurassic sandstone in the Oshima Belt, although several garnets suggest the source rocks including amphibolite facies metamorphic rocks that are not found in present rock assemblage of the Oshima Belt. These garnet assemblages suggest the sediment recycling from Jurassic rocks in the hinterland to Cretaceous forearc basin sediments and the derivation from older geological belt in East Asia.

Keywords: Cretaceous, Yezo Group, detrital garnet, chemical composition, provenance, sandstone