Early Archean (3.5 Ga) zircons from serpentinite mélange of the Kurosegawa belt in western Tokyo

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Archean zircons were found for the first time from Tokyo in central Japan. Eighteen grains of them occurred from a serpentinite mélange zone of the Kurosegawa belt of SW Japan. Zircons in the serpentinite are smaller than 60 μm in diameter with black opaque mineral. Their U-Pb ages and REE pattern were analyzed by using LA-ICPMS at Gakushuin University. One grain attains ^{207}Pb-^{206}Pb age of 3,561 ±16 Ma (Early Archean), which is plotted on the Concordia Line. Other 17 grains have discordant U-Pb ages; however, their ^{207}Pb-^{206}Pb ages concentrate in a narrow range of 3.5-3.8 Ga. The grain with concordant ages has enrichment in HREE, positive Ce anomaly, and negative Eu anomaly, that are common in zircons from granitoid, whereas other grains have an order of magnitude higher REE concentration without clear Eu anomaly. These results suggest the following possible origin of the Archean zircons in serpentinite.

These zircons were likely crystallized primarily in felsic magma but not in mantle periodtite, as the grain with concordant ages preserved isotopic information of Archean felsic rocks. Other grains probably have the same origin but secondarily metamorphosed, as suggested by the loss of Pb and addition of U and REE. Two processes are possible to explain the occurrence of such extremely old zircons in serpentinite: 1) Archean meta-granitoid was tectonically mixed into serpentinite within Phanerozoic orogenic belts in shallow crust, and 2) Archean granitoid subducted into the mantle during the Archean to be mixed with mantle peridotite. The South China block, from which Japan was originated, has dominant Proterozoic crust with extremely minor Archean one. The North China Craton has both Archean and Proterozoic crusts. The studied serpentinite with Archean zircon totally lacks Proterozoic and Phanerozoic zircons, even though the serpentinite mélange in the same area contains blocks of mid-Paleozoic granitoid. This supports the second explanation. Serpentinite in subduction-related orogens represents hydrated peridotite primarily from subducted oceanic lithosphere or from the wedge mantle beneath an arc. Archean granitoid probably once subducted into the mantle and its fragments returned to crustal surface through orogenic belt for the first time in the last three billion years. More discussion is needed to explain how to mix solely older Archean continental zircons with mantle periodtite without involving much younger grains.

Keywords: zircon U-Pb age, serpentinite, Archean, Kurosegawa belt

