Petrogenesis of oxidized manganiferous quartzite from the eclogite-bearing belt in the Ross orogen, Antarctica

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Oxidized manganiferous quartz-rich rocks of ocean environments have been reported from well-known high-*P* terranes including that from the Western Alps (Reinecke, 1998). We present petrological, geochemical, and geochronological data for such a manganiferous rock in the terrane suture zone of the Ross orogen, Antarctica. Schistose manganiferous quartzites crop out in the Lanterman Range, where the Cambrian eclogites and their retrograde products occur as tectonic lenses hosted by garnet–phengite and hornblende-biotite gneisses (*e.g.*, Kim *et al.*, 2019). Mineral assemblages of the quartzite are represented by epidote-group mineral (~0.5%) + garnet (~1.5%) + hematite (~1%) + phengite (~12%) + quartz (~85%), together with minor amounts of chlorite, zircon, monazite, and apatite. Porphyroblasts of garnet, epidote-group mineral and hematite enclose mineral inclusions such as tephroite, rutile, pyrophanite, chlorite and quartz. Spessartine-rich garnet porphyroblasts are relatively homogeneous in composition, except for their rims with abrupt increase in Fe. Epidote-group minerals commonly exhibit multiple growth zones; piemontite/epidote core, REE-rich piemontite inner mantle, manganoan allanite outer mantle, and epidote rim. The celadonite content of phengite is also zoned from Si-richer inner to Si-poorer outer domains. The EBSD measurements on granoblastic quartz indicate dominantly prism <a> slip at >500 °C. Only few fine-grained (<100 μm) zircon crystals were separated, including rare detrital crystals with low $\delta^{18}O$ values (3.5–4.1‰; c. 570–540 Ma). The majority of zircon is metamorphic with much higher $\delta^{18}O$ values (17.2–18.9‰; c. 516–497 Ma), which is compatible with extremely high $\delta^{18}O$ values (19.3–21.4‰) of matrix quartz. The chondrite-normalized REE pattern of the oxidized manganiferous quartzite is characterized by strong positive Ce and negative Eu anomalies (Ce/Ce* = 3.14; Eu/Eu* = 0.64). Our results suggest that the manganiferous quartzites originated from dominantly silica-rich chemical sediments of oxidized conditions, together with subordinate inputs from terrigenous clays and hydrothermal sources. Finally, the quartzite protoliths underwent subduction-related metamorphism during the Ross orogeny.

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Reinecke, T., 1998. Prograde high- to ultrahigh-pressure metamorphism and exhumation of oceanic sediments at Lago di Cignana, Zermatt-Saas Zone, western Alps. *Lithos* 42, 147-189.