Geological study on R2 ryolite in the Hokuroku District, Akita: their alteration patterns and relationship to Kuroko ores

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Kuroko ores (15 Ma) in the Hokuroku district are covered by hanging-wall rocks, mostly felsic volcanic rocks (termed as R2 rhyolite). Those felsic volcanic rocks also suffered from submarine hydrothermal alteration. However, relationship between alteration patterns in R2 rhyolite and spatial distribution of Kuroko ores is still unclear. Understanding such relationship has importance to provide an indicator to explore modern volcanogenic massive sulfide ores buried in sub-seafloor. Therefore, geological and petrological studies are performed on R2 rhyolite in Hokuroku district, Akita. Geological survey of R2 rhyolite was conducted in two areas: one is distal zone from Fukuzawa and Ezuri mines (A area), and the other is barren zone along Oshigenai stream (B area).
R2 rhyolite in A area can be divided into three stratigraphic layers. The lowermost layer is composed of volcanic breccia and lapilli with size from dozens to a few centimeters, and interpreted as an autobrecciated outer rim part of a felsic lava dome. The interspace of breccia is hydrothermally altered intensively, although some un-altered parts retain fluidal texture as elongated-unidirectional cluster of quartz inside each lapillus. Quartz veins with disseminated pyrite fills also common in the interspaces. Matrix-supported lapilli tuff (green colored) overlies the above lava dome. This layer contains lapilli-sized woody pumice and lapilli- to block-sized rhyolitic and basaltic lava. This layer represents submarine pyroclastic flow or resedimented one. Hydrothermal breccias intrude into this pyroclastic rock. Rhyolite lavas, which were less altered compared to others, occur as uppermost layer.
On the other hand, R2 rhyolite body in B area consists of several flow units, which pile more than 100 m in thickness. Each flow unit comprises two parts, massive and upper planer joint parts. Silica veins in several centimeters width occur in flow unit, while green-colored minerals such as celadonite are distinguished in the planer joint part. Sulfidic alteration is absent or much less in B area.
From the above results, sulfidic hydrothermal alteration is only limited in the distal zone of Kuroko mines. Therefore, it is concluded that submarine hydrothermal activities continued from Kuroko-forming to post-Kuroko periods in the same region. On the other hand, in the barren zone, the alteration of R2 rhyolite was caused by simultaneous interaction with seawater and hot R2 rhyolite lavas.

Keywords: Hokuroku district, Hanging-wall sequence of Kuroko ores, Post-Kuroko activity, Felsic volcanic rocks, Hydrothermal alteration

