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太古代枕状溶岩に微生物は住んでいたか？
Were Archean volcanic glasses habitats for microbial organisms?

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Submicron-tube structures have been found in quenched glasses of pillow lavas from Barberton (ca.3.4 Ga) and Abitibi (ca.2.7 Ga) Greenstone belts. These tubes are interpreted as products of bio-alteration (Furnes et al., 2003). However, abiotic processes could form the same structure, and some researchers are questioning biogenic origin of the tube structure (Grosch et al., 2014). Further examination of Archean volcanic glasses is important to constrain habitats of early life.

Here I examined pillow lavas from 2.7 Ga Abitibi Greenstone Belt in Canada. Pillow lavas have clear reaction rims, which were quenched and altered glasses before metamorphism. Typical mineral assemblages in reaction rims are paragonite, chlorite, actinolite, titanite, quartz, calcite, pyrite and epidote. Low metamorphic grade (lower greenschist facies) is suggested by those mineral assemblage. Mineral chemistries suggest that alkaline solutions was responsible for formation of primary minerals, implying alkaline 2.7 Ga ocean.

Titanite occurs in aggregates of fine crystals in chlorite matrix, and often accompanied by unclear “tubes.” Occurrence of titanite aggregates is identical to bio-alteration features found in other Archean pillow lavas. However, the length and density of “tubes” are much less compared to others. The examined samples in the present study were less metamorphosed compared to others (upper greenschist facies). Absence of clear “tubes” in less metamorphosed rocks suggest that “tubes” in Archean pillow lavas were not products of bio-alteration, but products of metamorphism.

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