Restored 3.2Ga oceanic hydrothermal sequence -Dixon Island Formation, Pilbara Craton, Australia.

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The 3.2 Ga Dixon Island Formation in the Cleaverville Group of the coastal Pilbara terrane is one of the best sequences preserving Archean hydrothermal stratigraphy and of containing bacteria-shaped materials (Kiyokawa & Taira, 1998, Kiyokawa et al., 2002). Based on detailed mapping in the Dixon Island Formation. we is restored hydrothermal oceanic surface in the middle Archean age.

The Dixon Island Formation, which is approximately 350 m in thickness, is composed of Rhyolite Tuff, Black Chert and Varicolored Chert Members. Based on sedimentary facies, sedimentary depth is approximately 500~2000m.

Many black-chert vein swarms in the Rhyolite Tuff Member indicate intensive low temperature hydrothermal activity during deposition the Black Chert Member which is formed 15~20 m in thickness. Microbial materials contains the Black Chert Member which composed of massive black chert, laminated black chert, greenish shale and tuffaceous laminated chert. The massive black chert has carbonaceous pisoids (0.3 mm~2 mm in diameter) similar with in the black chert veins. It contains wriggle-shape, rod-form and dendritic shape bacterial material. The laminated black chert contains many pseudomorph; such as, barite, halite and gypsum. Brown colored stromatolite-like wavy layer (10~20 cm in thick) preserved between the laminated black chert and is well continuous more than 1 km long. Fine iron pisoid content in the laminated black chert.

Total organic carbon (TOC) in black chert and black chert vein varied within 0.05~0.16 % (average 0.1 %) and carbon isotope (delta 13C) of these rocks are -30~ -16 per mil (average 26.4 per mill). These low evidences suggest carbonaceous grains and bacterial shape material in the black cherts are biogenic. Field observation and geochemical evidence suggest that the Dixon Island Formation preserved an example many microbial colony around hydrothermal vents. These microbial colony might be quickly fossilized by silicification during this hydrothermal activity. The origin of the carbon material of the black chert is the hydrothermal related bacterial material which seems living along the hydrothermal mound on the relatively shallow water hydrothermal environments.