

## Establishment of iron microelectrode measurement and its application to iron deposit re-sembling BIF

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Precambrian banded iron formation (BIF) is important for estimating the redox state of the global environment during that period, and many studies have been conducted until now. In the traditional model, BIF had been considered to be formed by oxidation of Fe(II) by cyanobacteria-released oxygen. However, it has been recently suggested that other microbial metabolisms, such as direct iron oxidation associated with carbon fixation of non-oxygenic Fe(II)-oxidizing phototrophic bacteria, were also involved in the formation. Therefore, its formation process is considered to be complicated much more than previously thought, and detailed investigation about the microbial processes that can potentially form BIF is required. This study aimed to reveal the formation processes of iron deposits found in Sambe hot spring in Shimane Prefecture, and applied both geochemical and geomicrobiological techniques. In previous study, it have been described that this deposit is mainly composed of iron hydroxide (ferrihydrite), and microbial composition at the deposit surface is dominated by iron-oxidizing bacteria (*Gallionella* sp.) with minor cyanobacteria. In this study, we applied the Fe(II) microelectrode in addition to the pH, redox, O<sub>2</sub> microelectrodes in order to accurately evaluate the microbial and inorganic precipitation occurring in the surface. By these microelectrodes, we measured the chemical profiles at the vicinity of deposit surface (about 1 mm from the surface) and found that all chemical profiles were almost the same both in light and dark conditions, indicating that contribution of photosynthesis was negligible. Fe(II) and O<sub>2</sub> consumption at the deposit surface implied that iron-oxidizing bacteria (*Gallionella* sp.) oxidized Fe(II) by using oxygen. This kind of iron precipitation process would provide an important knowledge about the formation process of BIF deposited when the ocean gradually became oxidative by cyanobacteria released oxygen. In addition, measurement method of Fe(II) microelectrode established in this study will be applicative to other types of BIF modern analogs, and it is expected that further details of BIF formation processes will be revealed.