



Microbial control of the formation of low-temperature hydrothermal iron-deposits at the 71°N vent field at the Arctic Mid-Ocean Ridge

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Large amounts of low-temperature siliceous Fe-deposits occur distal to a high-temperature hydrothermal vent area at the southwestern part of the Mohns Ridge in the Norwegian-Greenland Sea. The Fe-deposits are formed as yellow to rust coloured mounds and chimney-like structures along faults and fissures in the rift valley floor, for distances up to several kilometres. The deposits have a stratified structure of millimetres to centimetres thick laminated layers that are separated by centimetre sized open cavities. The individual layers have a highly porous microtexture, where some of the layers are dominated by branching, twisted filaments resembling stalks of iron-oxidising bacteria like *Gallionella sp* and the newly described *Mariprofundus ferrooxidans*, and others by much thinner, straight to curved Fe-fibers of unknown origin. Patchy accumulations of manganese are present within the majority of layers, but are most common at the surface of deposits. The REE composition of the deposited material shows a similar pattern to that of the basaltic crust, indicating formation from low-temperature hydrothermal fluids, derived from interactions between the basaltic crust and circulating seawater. Sediment particles of basaltic glass, high-temperature vent minerals like baryte, and diatoms within lamina that are present in discrete layers show that they sequentially formed at the surface of the deposits at the different stages of growth. This, together with the structural design of alternating layers of biogenic filaments and hollow spaces suggest that the formation of these deposits were

controlled by biofilms of Fe-oxidising microorganisms that developed at the interface between the reduced vent fluid and the surrounding oxidized seawater. Successive nucleation and precipitation of Fe-hydroxide (ferrihydrite) and amorphous silica on the microbial stalks resulted in the formation of the mounds and chimneys.