A role of bio-mineralization/ accumulation and bio-desorption of metals in "evolving" Earth-Surface

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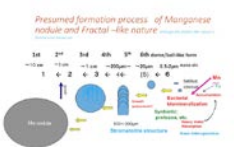
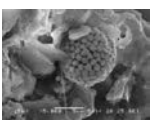
Many examples of bio-accumulation, absorption, desorption, and mineralization of some metals and toxic elements are known. They are summarized in perspective of "evolving" surface area of the Earth (Earth-Surface). Hazen *et al*.[1] has mentioned on mineral evolution, which is important suggestion. "Evolution of Earth-Surface" with central role of biosphere is evident in comparison to biological evolution. Examples of bio-accumulation of some metals are as follows: Mn nodules in deep sea has been suggested as stromatolite with fractal-like signatures [2] (Fig.1) and Precambrian Mn stromatolite is. Gunma Fe Ore is an example of BIM [3], which is recent deposit due to combination of microbes, moss and other organisms. Behaviours of toxic elements such as As- and Cs- contamination are also related to microbes' action [4] [5]. As near surface processes, microbes accumulate K, resulting in biotite-decomposition. Framboidal pyrite was bio-synthesized using microbes, SRB (Fig.2).

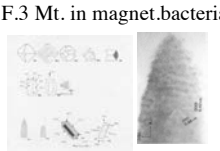
F.1 Mn nodule formation :



F.2 SRB & Framboidal pyrite



F.3 Mt. in magnet.bacteria



Hypothetical order on evolutionary crystal form changes of magnetite in magnetotactic bacteria is proposed: from octahedral-, hexagonal prism - to tear drop-type (Fig.3).

Their concrete processes and general scheme about relationship between minerals in geosphere and microbes in biosphere to "evolving Earth-Surface" are discussed.

[1] Hazen *et al*., 2008, *Am.Min*.,**93**,1693. [2] Akai *et al*., 2013, *Phys.Chem Earth*, **58-60**,42. [3] Akai *et al*.,1999, *Am. Min*., **84**, 171. [4] Akai *et al*., 2013, *Phys. Chem Earth*, **58-60** , 2. [5] Akai *et al*., 2013, P*hys. Chem Earth*., **58-60**,57.