Stracture of Fe-rich biofilms

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Biofilms are characteristically associated with water systems in the Earth. Fe-bacteria, such as Leptothrix, Gallionella and Siderocapsa, are the most common pioneering species in microbial communities. They make colonies to form Fe-rich biofilms or microbial mats in/on the water surface which is active oxic zone of the top surface. Biofilms of schwertmannite $Fe_8O_8(OH)_6SO_4$ (0.253 and 0.15 nm)were formed on the surface of cultured solution using mining waste water (Sasaki and Tazaki, 2001). Atomic-force microscopy showed the formation processes of the biofilms with submicron rugged structure on the primitive stage.

In this paper the biological structure of Fe-rich biofilms was observed. The structure is affected by the physical and chemical environmental anaerobic or oxidized condition, bacterial species, water chemical composition, and species interactions. The old idea the biofilms are simply microbes suspended in a homogeneous. Brownish black biofilms grow on the surface of river water in the Kakuma Campus of Kanazawa University, are of predominantly iron oxidizing bacteria, such as Leptothrix sp., Gallionella sp. and Toxothrix sp.. The biofilms use ferrous ions as their energy souce through the oxidation into ferric ions. TEM of the biofilms have revealed mucoid substances of bacteria, like polysaccharides are effective for adhesion of iron hydroxides produced through biomineralization of various bacterial cominities. The condensation process of ordered iron bacterial colonies considered to be a factor for increasing the thickness of microbial mats. This is the first time oriented Fe-bacterial sheet / nets in the colonies have been found in biofilms whithin few days aging time.