The Biomineralization of Iron Sulfides under Anoxic Conditions

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For about 9500 years high salinity water has been flowing from the Marmara Sea over the Bosporus to the Black Sea, increasing its salinity, anoxity and the amount of sulfate reducing bacteria (SRB). Authigenic biomineralization of framboidal greigites (FG) in the form of biologically controlled mineralization of ferrimagnetic iron sulfides led to the intracellular crystallisation of the greigite found in the magnetosomes of sulfate reducing bacteria (SRB) [1]. Since this time the FG have sizes of 2 to 13 μm in diameter and show rhythmical distribution in the sediment cores [2]. Under influence of oxygen the single crystals of greigites are changed partially to pyrite, without change of morphology. This pyritization may take place by transportation of framboidal greigites through oxidizing sea water or by influence of air on the sample. Transmission Electronic Microscopy (TEM) of an ultramicrotome section shows by electron diffraction and EDX analysis single crystals of a ferri -magnetic inverse thiospinel of a composition of $Fe^{2+}Fe^{3+}{}_2S_4$ and a cell edge of a = 9.868 Å. The micro - crystals of ~ 0.4 μm exhibit {111} as the dominant form accompanied by {100}, surrounded by a membrane [XL30ESEM/Philips]. Each cubo-octahedron crystal is tetrahedrally coordinated by 4 octahedra over {111} to form a 3-D array with cavities in form of 4 icosahedra. The 3-D array of the octahedra and the icosahedra form a super close package. The influence of oxygen was studied by TEM, ESEM and X-ray powder diffraction.

[1] Preisinger A., *ECM 22*, Budapest, Hungary, 2004, 45. [2] Preisinger A., Aslanian S., *GSA, Ann. Meet.*, Seattle, 2003.

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