Occurrence and crystal shape variabilities of framboidal pyrite as a proxy for redox condition.

Hiroshi Kitazato[1], Ryoko Nakanishi[2]

[1] IFREE, JAMSTEC, [2] Dept. Biol. Geosci., Shizuoka Univ.

Framboidal pyrite in marine sediments provide a useful proxy for determining oxic or euxinic bottom environments. Pyrite crystals mainly form inside of cavities of protistan shells, such as foraminiferal tests and/or diatom frustules. Framboid size has used to be a proxy of oxic/anoxic conditions. The aim of this study is to observe both occurrences and crystal shapes of framboidal pyrite which were formed at marine sediments and within planktonic or benthic foraminiferal test cavities. Samples used for the study were collected from different environmental settings, both oxic (off Shikoku, Oki Basin in the Japan Sea and Central part of Sagami Bay) and euxinic environment (sapropel deposits of Japan Sea core samples, Kaiike at KamiKoshiki Island and off Hatsushima Island of Sagami Bay). We try to discuss the relationship between depositional environments and the crystal shapes of framboidal pyrite.

Four crystal shapes, hexahedral, octahedral, octa-hexa complex and spherical, were recognized among observed samples. In euxinic sediments, most framboidal pyrite crystals were octahedral shape, whereas in oxic sediments octa-hexa-complex shape predominated. The differences in crystal shapes may be controlled by sulfide concentration and bacterial activities during crystal nucleation and growth. Varieties of framboid diameters are also existed among samples. Framboid diameters were mostly the same range and small in euxinic environment, whereas it varied in oxic environment. Framboid diameters may be determined in proportion to growth time of crystals, because every framboid is composed of same numbers of crystals. Large framboid is consisted of large crystals. Abundance of particulate organic materials is also strongly related to hydrogen sulfide concentration for sulfate-reducing bacteria.

Even though precise environmental factors during crystal foramtion of pyrite, it is clear that octa-hexa-complex shapes mainly crystalized under oxic environments. Crystal shapes may be potential to use for a proxies of oxic-anoxic environment.