

Sedimentary pyrite morphology in sediments of a Western Boundary Upwelling System, Cabo Frio, Brazil

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A study of pyrite morphology and grain size distribution was performed in four sediment cores retrieved from a tropical western boundary upwelling system (Cabo Frio, Brazil) in order to identify micro-scale diagenetic processes. Pyrite framboids were predominant with a wide size distribution varying between 2 and 175 μm , while the individual microcrystals sizes ranged between 0,1 and 8 μm . The Framboids size distribution not changed with the depth in the sediment profiles, reflecting a condition of nonsteady-state for the pyrite grow. The low abundance of pyrite framboids in the upper sediment layers are probably due to the limitation of pyrite reactants for nucleation and growth, supported by low CRS (<0,06 %) and DOP (<15 %) values of the sediments.

Pyrite was also found as irregular masses (~130 μm) composed by framboid aggregates associated with euhedral crystals, offering nucleation surfaces for at least four generations of crystals, each one with relatively uniform sizes. The presence of poly-grown framboid, formed by the aggregation and fusion of minor framboids was also observed. The process of framboidal successive crystal overgrowths, and surface oxidation, as well as the dissolution of microcrystals may be explained by pyrite transport from reduced zones to more oxidizing conditions in the sediments as a result of benthic faunal bioturbation and physical sediment resuspension. These morphological characteristics added to the framboidal wide size distributions (>150 μm), indicates that pyrite formation in the studied sediment cores occurred under a dynamic redox-regime with abundant oxidants, supporting that framboids formed under sediments with oxic or dysoxic conditions are larger and more variable in size than those formed under euxinic water conditions.