Fe-Mn Macrooncoids in the Eastern External Subbetic (SE Spain): Evidence for Microbial Mediated Origin

Matías Reolid, Luís M. Nieto, and Juan Jiménez-Millán
Departamento de Geología. Universidad de Jaén. E-23071 Jaén, Spain

During the Mid-Late Jurassic boundary, the Southern Iberian Palaeomargin showed mixed features of a transform and a passive margin where the External Subbetic was made up by a lot of pelagic swells. A major unconformity with a Middle Bathonian-Middle Oxfordian gap is represented in this sector by neptunian dykes, firmgrounds, hardgrounds and Fe- Mn banded crusts. The surface is characterized by Fe-Mn macrooncoids coating ammonoids moulds. The macrooncoids are 6 cm mean-size and the coat is usually less than 3 cm thick.

The mineral composition of the coating is goethite, calcite, lithiophorite and cryptomelane. In general, the chemical composition of the crusts is mainly dominated by Fe_2O_3 (≈ 40%) and MnO (≈ 20%).

The banded crusts are constituted by microbial laminated fabrics with planar and arborescent morphologies. Alternation between planar and arborescent morphologies responds to minor changes in sedimentation rate.

Some agglutinated foraminifera participate in the Fe-Mn crusts such as Thurammina, Placopsilina and Tolypammina. Frequent microspheres with spherical to ovoid shapes probably corresponds to microbes. Bacterial and fungal filaments are observed in SEM analyses. The microbial mats are constituted by a disperse web of filaments with a branching tube-like morphology with rectangular and y-shaped ramifications with variable diameters between 2 and 8 μm. Taxonomical approximation of the microbiotas is difficult but the morphology resemble to filamentous cyanobacterium Microcoleus.

The precipitation of Fe-Mn is interpreted in relation to chemoorganotrophic behaviour of the benthic microbial communities. The key is in the Mn content of the crusts. It is well established that in modern environments efficient precipitation of Mn from natural water depends largely on the presence of Mn-oxidizing microorganisms. Inorganic precipitation mechanisms are regarded as insufficient for accumulation of significant amount of MnO in natural environments. Sediment-starved zones of pelagic swells of External Subbetic were favored places for microbially mediated authigenesis.

Key words: Laminated microfabric, Microbial chemosynthesis, Pelagicswells, Middle-Upper Jurassic