Biomineralization process in magnetotactic bacteria and

calcareous sponges

Over 60 different minerals are known to be produced by organisms in a process called biomineralization. In biomineralization, organisms passively or actively, but selectively, accumulate chemical elements from the environment and transform them into mineral structures inside or outside the cell [1]. Biomineralization processes play crucial roles in ecosystems as many of these organisms participate in the geochemical cycles of major elements necessary to life. About two billion years ago, after the great collapse of life, which was anoxic, due to the release of oxygen by the activity of cyano bacteria, magnetotactic bacteria appeared. There are the first organism which syntheses crystal, magnetite or greitgite. 0.5 billion years ago appeared sponges which are the first multicellular organism.  Many sponges have internal skeletons of [spongin](https://en.wikipedia.org/wiki/Spongin%22%20%5Co%20%22Spongin) and/or spicules of [calcium carbonate](https://en.wikipedia.org/wiki/Calcium_carbonate) or [silicon dioxide](https://en.wikipedia.org/wiki/Silicon_dioxide). In general, the formation of minerals are under precise biological control and is mediated by a mineralization process, which is known as biologically controlled mineralization. This phenomenon will be illustrated by the presentation of two processes of biomineralization, that of magnetite in the case of magnetotactic bacteria [2] and spicules of calcite in the case of sponges of the calcareous species [3].

[1] Weiner, S. & Dove, P. M. An overview of biomineralization processes and the problem of the vital effect. *Rev. in Mineral. Geochem.* 54, 1–29 (2003).

[2] J. Werckmann et al., Localized iron accumulation precedes nucleation and growth of magnetite crystals in magnetotactic bacteria, Sci. Rep. 7 (2017

 [3] A.L. Rossi et al., Long-range crystalline order in spicules from the calcareous sponge Paraleucilla magna (Porifera, Calcarea), Acta Biomater. 10 (2014).

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