



Authigenic minerals: Biologically influenced and induced organomineralization

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Organominerals are minerals precipitated by interactions with organic matter without enzymatic control. Organomineralization of authigenic carbonate minerals depends on two key components: (1) the “carbonate alkalinity engine” impacting the calcium carbonate saturation index and (2) the organic matrix comprised of extracellular organic matter (EOM), which provides a template for carbonate nucleation. The alkalinity engine can be “intrinsic” when microbial metabolisms increase supersaturation or lower the kinetic barrier of precipitation, or “extrinsic” when the physicochemical environment creates the conditions for mineral formation. The organic matrix produced by various communities within the microbial mats is known to influence nucleation, morphology and mineralogy of minerals through binding of cations. By playing with these two key components, three types of authigenic minerals can be formed: (1) a purely physicochemical precipitation on an abiotic substrate, (2) a precipitation “influenced” by the presence of an organic matrix but resulting from a physicochemical forcing (environmentally driven), or (3) a “microbially-induced” precipitation, in which both supersaturation and organic matrix are resulting from microbial activity. In this keynote, we will review important processes involved in the precipitation of authigenic carbonate minerals in modern microbial mats and open the discussion on the potential use of authigenic carbonate minerals as biosignatures in the fossil record.