

Interactive comment on “Cyanobacterial calcification in modern microbialites at the submicrometer-scale” by E. Couradeau et al.

Anonymous Referee #1

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In their manuscript, the authors investigated the calcification processes of modern cyanobacteria for understanding the presence/absence of microfossils in the rock records as well as for recognizing biotic/abiotic origin of “microfossils”. This topic closely relates with the studies of life history and paleo-environment, and potentially has significant impact on a wide range of readers. The authors tackled this interesting topic by applying advanced microscopic techniques, which was mostly successful. Nevertheless, I have some questions and comments as listed below.

1) As the authors described, their studied microbialite was mostly composed of hydromagnesite, which is rare mineral as a constituent of microfossil and microbialite in the rock record. Although the authors focused on the peripheral aragonite parts, the origin of hydromagnesite should be discussed (ex. biotic, abiotic or diagenetic etc.), because

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it may relate with the fate of aragonite. If hydromagnesite is the diagenetic product of peripheral aragonite, it would become difficult to apply the result of this study to the rock records.

2) The authors used the term “organic matter (OM)” in the Abstract, while the term EPS was used in the most part of the manuscript. The usage of EPS is recommended here, too.

3) For CLSM study, the authors conducted simultaneous excitation by three lasers. However, the emission spectrum of DAPI is very broad (about 400-600 nm), and simultaneous excitation and image acquisition by three channels will cause severe cross-talk. Indeed, the quality of Fig. 1C looks not good.

4) The authors concluded that Type 1 aragonite precipitated due to photosynthetic modification of local chemistry (p.3327, l. 5-6), while they discussed that pH increase by photosynthesis (=photosynthetic modification of local chemistry) is negligible in their study site (p. 3324, l. 15-p. 3325, l. 2). To avoid this contradiction, the result of following literature would be useful: Shiraishi (2012, *Geochim. Cosmochim. Acta* 77, 157-174). In his study, the occurrence of photosynthetic CaCO₃ precipitation was recognized even under high DIC condition.

Typing errors p. 3315, l. 18-19: (Arp et al., 2001 mention... p. 3326, l.23: Mg²⁺” should be superscript.

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