

Interactive comment on “Calcite and vaterite biosynthesis by nitrate dissimilating bacteria in carbonatogenesis process under aerobic and anaerobic conditions” by Marwa Eltarahony et al.

Anonymous Referee #3

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General comments The article (bg-2019-444) explores the biogenically induced carbonate precipitation triggered by nitrate reducing bacteria in both oxic and anoxic environments. Three types of nitrate reducing bacteria were isolated from three different, non-calcareous sampling sites in Egypt, specified, and incubated in 200 ml anoxic and oxic incubation media at 30°C for 10 days. Two incubation media without bacterial cultures served as references. During that time different parameters like pH, nitrate and nitrite concentrations, bacterial count, electrical conductivity, and nitrate reductase activity were analyzed. The deposited CaCO₃ amount was quantified, the type and morphology were investigated by XRD, EDX, and SEM analysis. The present study demonstrates that (I) the biogenically induced carbonate precipitation by nitrate reduc-

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ing bacteria is more pronounced under during aerobic growth than during anaerobic conditions and that (II) the type (in this case calcite and vaterite) and morphology of the formed carbonate is controlled by species and growth conditions. The study represents a significant contribution to the research on carbonate formation and provides a potential application in the carbonate-processing industry. It addresses a relevant research field within the scope of BG, however, there are major aspects that need to be worked on before considering a publication: Specific comments The manuscript could benefit from a language check. Some sentences are almost impossible to understand. The partly confusing text structure can significantly be improved. There are many literature references distributed in the results and discussion chapter that have little relation to the text before and after (for instance, Lines 174-179, 203-207, 298-300, 313-316). I don't see how these sentences support the discussion or how they can lead to the conclusions. Further, I couldn't read the figure because of the poor quality. Figure 3: I would suggest to add two diagrams showing the parameters of the anoxic and oxic control media, present all diagrams on the same size, and use the same colors for the same parameters. Line 95: If those bacteria support CaCO₃ precipitation, why was it possible to isolate them from a non-calcareous habitat? Chapter 2.3: this chapter describes the experimental incubation conditions; I think this should be reflected in the title. Line 134: maybe a short description about the anoxic incubation set-up? Chapter 2.5 this chapter should be merged with chapter 2.3 Line 174-179: what does this information have to do with identification and isolation of the studied bacteria? These sentences seem lost there. Line 191: this title is too general. The whole paper is about CaCO₃ deposition. This chapter rather describes the relationship between NR, oxic conditions and biogenically induced carbonate precipitation. Line 211-213: this is an important general observation and explanation that is followed by description of the results. This text structure should be changed. Line 226-228: I don't understand this sentence. Also, a new paragraph starts here. The description and the discussion of the results is mixed up throughout this chapter. I would suggest to change that. Line 240-241: How is this information about a completely different microbe related to the

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former sentence? How does this information help you to get to your conclusions? I think this sentence, as it stands there, is not necessary. Line 243-245: How much sense does it make to compare the CaCO₃ precipitation amounts (in different units!) from three completely different experiments? What can we learn from that? It is not productive to only list results from different experiments if no conclusion can be drawn from that. Chapter 3.4: I would recommend to further subdivide this chapter because this helps to build a proper text structure. Line 298-300: How does this notion of another study stand in relationship to the sentences before and after? How does it impact your discussion? I don't think this information is helpful here. Line 313-316: Another notion of a further study. How much sense does this short notion about a study with a fungus species make? How does this information help your argumentation? Line 320: what exactly was the finding of Li et al. (2012)? Line 321-323, 326-328: see comments above (Line 298-300, 313-316) Line 331: why the reference? Isn't this the conclusion of your study? Line 375-376: see comments above (Line 298-300, 313-316) Line 377-379: see comments above (Line 298-300, 313-316) Line 384-385: this sounds like a great conclusion. Line 490: maybe sum up likely reasons for the formation of the different CaCO₃ types. Technical corrections Line 50: "microbial", not "Microbial" Line 54: confusing reference Line 67: do you mean microorganisms with different metabolisms? Line 70: What exactly seems to be more abundant? Line 98: CaCO₃ crystal Line 106: where all three bacteria found in all three sampling sites? Line 118: 1 μ mol Line 121: using 16S... Line 122: what is PCR? Line 123: "in" instead of "elsewhere" Line 124: what does BLAST mean? Line 131: What is a M9 media? Line 136: 10,000 g Line 143: delete one parenthesis Line 144: operates Line 163: What is APHA? Line 175: What is MICCP? Line 189: please rewrite. Line 192: please add the reference after "preceding literature" Line 195: red semicolon Line 197: different appearances: the strains or the crystals? Please be more specific. Line 198: please add parentheses around (Fig. 2) Line 201: delete "were". Appeared in all anaerobic cultures? Also, the comparison between irregular crystals in the anaerobic cultures and fine white powder in the supposedly aerobic culture appears strange. The former describes the morphol-

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ogy of crystals, the latter can roughly tell something about the crystal size. Line 203: “. . .brown aggregated pellets.” Do you speak about the aerobic culture? Line 209: were instead of “. . .was monitored.” Line 249: “It is worth to mention. . .” Why is it worth to mention? Line 253: “by almost all of the parameters”? Line 255-258: this is difficult to understand Line 277: are Line 281: “. . .EDX peaks that. . .” Line 286-288: reference is missing Line 292: was instead of were Line 352-354: please rewrite. Line 358-359: reference is missing. Line 359-360: either delete or elaborate further. Line 363: “. . .is controlled by several factors.” Line 367: this sentence is incomplete. Line 387: cations are always positively charged. Line 451-453: this sentence is incomplete. Line 453: better: vaterite formation. Line 465: better for what? Line 466-467: confusing sentence.

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