

**Reviewer 2**

Comments of the reviewer	Reviewed manuscript	Author comments / revised manuscript
<p>” The authors present an interesting study of the process of alteration of six selected microstructures when submitted to the action of hydrothermal fluids. They assess the process of transformation of either biogenic aragonite or calcite into inorganic calcite with time. Although the simulated diagenetic alteration conditions are probably a small portion of the whole range existing in ambient conditions, the study is highly meritorious.</p> <p>Particularly, the application of EBSD analysis provides a wealth of information.</p> <p>Although I am not expert on diagenesis, I would be surprised if such a picture of the progression of a simulated diagenetic alteration ever existed.</p> <p>The study is significant in its field, and the conclusions are backed by data. It is technically very sound. The statistics is consistent. The Ms is well written and profusely illustrated. The selected microstructures are representative of the range present in molluscs.</p> <p>I am only concerned about the dissonance between the references in text and in the reference list. Many in-text references are not found at the end and the other way round (see at the end). This has to be amended before publication.”</p>		<p>It is double checked that all references that are stated in the text are in the reference list and vice versa.</p>
<p><b>“Minor comments:</b> Abstract.- I do not know if the journal allows for the presence of references within the abstract.</p>		<p>In the revised version of the manuscript we are not citing any references in the abstract, even though this would be possible.</p>

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Please check.”		
“Page 2, line 8.- “Despite ongoing and extensive research”, do you mean ‘previous’ extensive research.”	“...Despite ongoing and extensive research, carbonate diagenesis remains only partly understood....”	“...Despite previous extensive research, carbonate diagenesis remains only partly understood....”
“Page 3, line 2.- delete “s” after “M.””		“s” deleted
“Page 3, line 8.- ‘were carried out’ should not be italicized; “tissue” should be plural.”		Changed accordingly
“Page 5, line 13.- Correct spelling is Carvajal.”		Changed accordingly
“Page 5, lines 25-26.- “consists”, “consisting”; avoid redundancy.”	“...The skeleton of the modern stony coral <i>Porites</i> sp. consists of an assemblage of spherulites consisting of aragonitic needles and fibrils...”	“...The skeleton of the modern stony coral <i>Porites</i> sp. consists of an assemblage of spherulitic aragonite needles and fibrils...”
“Page 5, line 28.- “When sectioned in 2D”, section, by definition, provides a 2D view; ‘in 2D’ can be deleted.”		Changed accordingly
“Page 7, line 7.- “sp.”, here and elsewhere, should not be italicized.”		Changed accordingly
“Page 7. line 31.- “compare Fig. 4A with right hand part, framed in green with Fig. 4D”, I would suggest ‘compare Fig. 4A with Fig. 4D, right hand part, framed in green’.”		Changed accordingly
“Page 9, line 8.- Comma after “shows”.”	“...However, as the phase map in Fig. 9E shows a phase...”	“...However, as the phase map in Fig. 9E shows, a phase replacement of biogenic...”
“Page 10, line 4.-Comma after “sediments”.”	“...with the death of the organism and burial in sediments biomineralised...”	“...Accordingly, with the death of the organism and burial in sediments, biomineralised hard...”
“Page 10, line 20.- Correct spelling is ‘Etschmann’. Jonas et al. 2015 appears as 2017 in References.”		Changed accordingly and Jonas et al. (2017) replaced by Jonas et al. (2014) in the list of references.
“Page 11, lines 13-14.- The sentence contained there is either incomplete or the initial “In” needs to be removed.”	“...In the absence of primary porosity and/or secondary porosity that should have been generated at early stages of alteration is attributed to the positive molar volume change involved in the aragonite by calcite replacement....”	“...The absence of primary porosity and/or secondary porosity that should have been generated at early stages of alteration is attributed to the positive molar volume change involved in the aragonite by calcite replacement...”
“Page 13, line 21.- Correct spelling is “Fernández-		Changed accordingly

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Díaz”.”		
“Page 14, lines 22-23.- “as well as the increased prevalence of the nacreous shell layer of <i>M. edulis</i> relative to calcitic shell layers in seashore sediments.” Do the experimental conditions really simulate the diagenetic conditions in nearshore sediments? If so, please provide additional data and/or references.”		Hydrothermal experiments applied do not simulate realistic diagenetic conditions in sediments.
“Page 15, line 3.- Replace “the nacreous tablets are” by ‘nacre is’; the microstructure is nacre.”		Changed accordingly
“Page 15, line 20.- Delete “of”.”		Changed accordingly
“Page 15, line 31.- “Biogenic aragonite was dissolved for the reprecipitation of low-Mg calcite”, this is odd; please rewrite.”		This corresponds to a basic dissolution-precipitation reaction by which the thermodynamically less stable CaCO <sub>3</sub> phase (biogenic aragonite) dissolves. Thus, the solution becomes supersaturated with respect to the thermodynamically more favourable phase (calcite) which precipitates and replaces the former aragonite.
“Page 16, line 9.- Sorauf (1980) appears as 1981 in References.”		Changed accordingly
“Page 16, line 28.- Comma after “immediately”.”		Changed accordingly
“age 17, line 11.- ‘replacement’ instead of “replaced”.”		Changed accordingly
“Page 18, line 14.- “Their” should be lower case.”		Changed accordingly
“Page 19, line 33.- “tuberculate” should be ‘tuberculata’.”		Changed accordingly
“Page 21, line 13.- “cabonates”, ‘carbonates’.”		Changed accordingly
“THE following in-text references have not been found in the References list (per order of appearance): - Patterson and Walter, 1994 - Ku et al. 1999		References added: Patterson, W. P. and Walter, L. M.: Sydepositional diagenesis of modern platform carbonates: evidence from isotopic and minor element data, <i>Geology</i> , 22, 127-130, 1994.

<ul style="list-style-type: none"> <li>- Brad et al. 2004</li> <li>- Zazzo et al. 2004</li> <li>- Immerhauser et al. 2015</li> <li>- Ridgway and Richardson 2011</li> <li>- Krause-Nehring et al. 2012</li> <li>- Rodgway et al. 2012</li> <li>- Crippa and Raineri 2015</li> <li>- Blanchon et al. 2009</li> <li>- Hahn et al. 2012</li> <li>- Nidiyasari et al. 2015</li> <li>- Brown et al. 1962</li> <li>- Cardew and Davey 1985</li> <li>- Regenberg et al. 2007</li> <li>- Hover et al. 2001</li> <li>- Cherns et al. 2008</li> <li>- Wright et al. 2003</li> <li>- James et al. 2005</li> <li>- Harper 1998</li> <li>- Harper 2000</li> <li>- Kidwell 2005</li> <li>- Land 1967 "</li> </ul>		<p>Ku, T. C. W., Walter, L. M., Coleman, M. L., Blake, R. E., and Martini, A. M.: Coupling between sulfur recycling and syndepositional carbonate dissolution: evidence from oxygen and sulfur isotope composition of pore water sulfate, South Florida Platform, U. S. A., <i>Geochim. Cosmochim. Acta</i>, 63(17), 2529-2546, 1991.</p> <p>Brand, U.: Carbon, oxygen and strontium isotopes in Paleozoic carbonate components: an evaluation of original seawater-chemistry proxies, <i>Chem. Geol.</i>, 204(1-2), 23-44, 2004.</p> <p>Zazzo, A., Lécuyer, C., Sheppard, S. M., Grandjean, P., and Mariotti, A.: Diagenesis and the reconstruction of paleoenvironments: a method to restore original <math>\delta^{18}\text{O}</math> values of carbonate and phosphate from fossil tooth enamel, <i>Geochim. Cosmochim. Acta</i>, 68(10), 2245-2258, 2004.</p> <p>Immenhauser, A., Schöne, B. R., Hoffmann, R., and Niedermayr, A.: Mollusc and brachiopod skeletal hard parts: intricate archives of their marine environment, <i>Sedimentology</i>, 63(1), 1-59, 2015.</p> <p>Ridgway, I. D., Richardson, C. A., and Austad, S. N.: Maximum shell size, growth rate, and maturation age correlate with longevity in bivalve molluscs, <i>J. Gerontol. A Biol. Sci. Med. Sci.</i>, 66(2), 183-90, 2011.</p> <p>Krause-Nehring, J., Brey, T., and Thorrold, S. R.: Centennial records of lead contamination in northern Atlantic bivalves (<i>Arctica</i></p>
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		<p><i>islandica</i>), Mar. Pollut. Bull., 64(2), 233-40, 2012.</p> <p>Blanchon, P., Eisenhauer, A., Fietzke, J., and Liebetrau, V.: Rapid sea-level rise and reef back-stepping at the close of the last interglacial highstand, Nature, 458, 881-884, 2009.</p> <p>Hahn, S., Rodolfo-Metalpa, R., Griesshaber, E., Schmahl, W. W., Buhl D., Hall-Spencer, J. M., Baggini, C., Fehr, K. T., and Immenhauser, A.: Marine bivalve shell geochemistry and ultrastructure from modern low pH environments: environmental effect versus experimental bias, Biogeosciences, 9, 1897-1914, 2012.</p> <p>Nindiyasari, F., Ziegler, A., Griesshaber, E., Fernández-Díaz, L., Huber, J., Walther, P., and Schmahl, W. W. (2015) Effect of hydrogel matrices on calcite crystal growth morphology, aggregate formation, and co-orientation in biomimetic experiments and biomineralization environments, Cryst. Growth Des., 15(6), 2667-2685, 2015.</p> <p>Brown, W. H., Fyfe, W. S., and Turner, F. J.: Aragonite in California glaucophane schists, and the kinetics of the aragonite-calcite transformation, J. Petrol., 3, 566-582, 1962.</p> <p>Cardew, P. T. and Davey, R. J.: The kinetics of solvent-mediated phase transformations, Proc. Roy. Soc. London, Ser. A Math. Phys. Eng. Sci., 398, 415-428, 1985.</p> <p>Regenberg, M., Nürnberg, D., Schönfeld, J., and</p>
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		<p>Reichert, G. J.: Early diagenetic overprint in Caribbean sediment cores and its effect on the geochemical composition of planktonic foraminifera, <i>Biogeosciences</i>, 4, 957-973, 2007.</p> <p>Hover, V. C., Walter, L. M., and Peacor, D. R.: Early marine diagenesis of biogenic aragonite and Mg-calcite: new constraints from high-resolution STEM and AEM analyses of modern platform carbonates, <i>Chem. Geol.</i>, 175, 221–248, 2001.</p> <p>Cherns, L., Wheelley, J. R., and Wright, V. P.: Taphonomic windows and molluscan preservation, <i>Palaeogeogr. Palaeoclimatol. Palaeoecol.</i>, 270, 220-229, 2008.</p> <p>Wright, V. P., Cherns, L., and Hodges, P.: Missing molluscs: field testing taphonomic loss in the Mesozoic through early largescale aragonite dissolution, <i>Geology</i>, 31, 211-214, 2003.</p> <p>James, N. P., Bone, Y., and Kyser, K. T.: Where has all the aragonite gone? Mineralogy of Holocene neritic cool-water carbonates, Southern Australia, <i>J. Sediment. Res.</i>, 75(3), 454-463, 2005.</p> <p>Harper, E. M.: The fossil record of bivalve molluscs, in: Donovan S. K. and Paul C. R. C. (eds.) <i>The adequacy of the fossil record</i>, John Wiley and Sons, Chichester, 243-267, 1998.</p> <p>Kidwell, S. M.: Shell composition has no net impact on large-scale evolutionary patterns in mollusks, <i>Science</i>, 307, 914-917, 2005.</p> <p>Land, L. S.: Diagenesis of skeletal carbonates, <i>J.</i></p>
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		<p>Sediment. Res., 37(3), 914-930, 1967.</p> <p>General comments:</p> <ul style="list-style-type: none"> <li>- Brad et al, 2004 → Brand, 2004</li> <li>- Ridgway and Richardson, 2011 → Ridgway et al., 2011</li> <li>- Rodgway et al., 2012 → Ridgway et al., 2011</li> <li>- Crippa and Raineri, 2015 → already added</li> <li>- Harper, 2000 → deleted</li> </ul>
<p>“THE following references in the References list have not been found in the main text:</p> <ul style="list-style-type: none"> <li>- Addadi et al. 2006</li> <li>- Allison et al. 2007</li> <li>- Atree-Williams et al. 2017</li> <li>- Barthelat and Spinoso 2007</li> <li>- Bathurst 1975</li> <li>- Böhm et al. 2006</li> <li>- Brahmi et al. 2012</li> <li>- Brocas et al. 2013</li> <li>- Butler et al. 2009</li> <li>- Cartwright and Checa 2007</li> <li>- Checa et al. 2006</li> <li>- Checa et al. 2009</li> <li>- Checa et al. 2011</li> <li>- Cohen et al. 2001</li> <li>- Currey et al. 2001</li> <li>- Dauphin et al. 1989</li> <li>- Elliot et al. 2003</li> <li>- Gries et al. 2009</li> <li>- Grossman et al. 1993</li> <li>- Heiss 1994</li> <li>- Hippler et al. 2009</li> </ul>		<p>References included into the manuscript:</p> <ul style="list-style-type: none"> <li>- Addadi et al., 2006</li> <li>- Allison et al., 2007</li> <li>- Butler et al., 2009</li> <li>- Checa et al., 2006</li> <li>- Checa et al., 2009</li> <li>- Checa et al., 2011</li> <li>- Korte et al., 2005</li> <li>- Marchitto et al., 2000</li> <li>- McGregor and Gagan, 2002</li> <li>- Barthelat and Spinoso, 2007</li> <li>- Bathurst, 1975</li> <li>- Böhm et al., 2006</li> <li>- Cohen et al., 2001</li> <li>- Elliot et al., 2003</li> <li>- Heiss, 1994</li> <li>- Hippler et al., 2009</li> <li>- Cartwright and Checa, 2007</li> <li>- Gries et al., 2009</li> <li>- Jackson et al., 1988</li> <li>- Levi-Kalisman et al., 2001</li> <li>- Li et al., 2006</li> <li>- Marin and Luquet, 2004</li> <li>- Mayer, 2005</li> </ul>

<ul style="list-style-type: none"> <li>- Hubbard et al. 1990</li> <li>- Jackson et al. 1988</li> <li>- Korte et al. 2005</li> <li>- Levi-Kalisman et al. 2001</li> <li>- Li et al. 2006</li> <li>- Marchitto et al. 2000</li> <li>- Marin and Luquet 2004</li> <li>- Mayer 2005</li> <li>- McGregor and Gagan 2002</li> <li>- Metzler et al. 2007</li> <li>- Morton 2011</li> <li>- Nudelman et al. 2006</li> <li>- Nudelman et al. 2008</li> <li>- Oeschger and Storey 1993</li> <li>- Parkinson et al. 2005</li> <li>- Putnis et al. 2005</li> <li>- Raffi 1986</li> <li>- Richardson 2001</li> <li>- Rüggeberg et al. 2008</li> <li>- Sanchez et al. 2005</li> <li>- Schöne et al. 2004</li> <li>- Schöne et al. 2005a</li> <li>- Schöne et al. 2005b</li> <li>- Schöne and Surge 2012</li> <li>- Taylor 1976</li> <li>- Wanamaker et al. 2008</li> <li>- Wang and Gupta 2011</li> <li>- Wang et al. 2011 “</li> </ul>		<ul style="list-style-type: none"> <li>- Metzler et al., 2007</li> <li>- Morton, 2011</li> <li>- Raffi ,1986</li> <li>- Richardson, 2001</li> <li>- Rüggeberg et al., 2008</li> <li>- Schöne et al., 2004</li> <li>- Schöne et al., 2005a</li> <li>- Schöne et al., 2005b</li> <li>- Schöne and Surge, 2012</li> <li>- Wanamaker et al., 2008</li> </ul> <p>References deleted:</p> <ul style="list-style-type: none"> <li>- Altree-Williams et al., 2017</li> <li>- Brahmi et al., 2012</li> <li>- Brocas et al., 2013</li> <li>- Currey et al., 2001</li> <li>- Dauphin et al., 1989</li> <li>- Grossman et al., 1993</li> <li>- Hubbard et al., 1990</li> <li>- Nudelman et al., 2006</li> <li>- Nudelman et al., 2008</li> <li>- Oeschger and Storey, 1993</li> <li>- Parkinson et al., 2005</li> <li>- Putnis et al., 2005</li> <li>- Sanchez et al., 2005</li> <li>- Taylor, 1979</li> <li>- Wang and Gupta, 2011</li> <li>- Wang et al., 2011</li> </ul>
<p>“Figure A16.- Panel A is simply the sum of B and C. It can be simplified.”</p>		<p>Figure A16 was designed to be divided into three panels. Thus, the reader is able to directly compare the grain size scattering for both nacre containing specimens: <i>M. edulis</i> and <i>H. ovina</i> (panel A). Panels</p>



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		B and C, however, each show data obtained only for one specimen so that no data points obtained for species A are hidden by data points of species B.
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