

***Interactive comment on “Confocal Raman microscopy as a tool to describe different mineral and organic phases at high spatial resolution within marine biogenic carbonates: case study on *Nerita undata* (Gastropoda, Neritopsina)” by G. Nehrke and J. Nouet***

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Remarks to Editor and Authors (Biogeosciences Discuss., 8, 5563-5585, 2011)

Title: ‘Confocal Raman microscopy as a tool to describe different mineral and organic phases at high spatial resolution within marine biogenic carbonates: case on *Nerita undata* (Gastropoda, Neritopsina)’

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Authors: G. Nehrke and J. Nouet

General Comments: The manuscript describes the novel application of Confocal Raman Microscopy (CMS) for the characterization of biomineral structures at high spatial resolution. Although this manuscript focuses on a preliminary assessment of the technique, using a gastropod shell, the use of CMS represents a great advancement for biomineral studies compared to the single use of confocal microscopy (e.g., Pérez-Huerta et al., 2008 – Journal of Microscopy) or Raman spectroscopy (e.g., Hild et al., 2008 – Journal of Structural Biology). This manuscript, therefore, is a significant contribution that can be published pending a better explanation of specific areas analyzed in this study and improving the discussion on the characterization of organic phases (see Specific / Technical Comments).

Specific Comments:

-Authors have to provide a precise location of CMS scans in reference to Fig. 1c, and the context for Figs. 2b-f. Otherwise, it is a difficult to follow the explanation in the text. - Authors claim that this technique can provide crystallographic information (Section 3.1). This claim, however, can be misleading because this technique by itself cannot provide specific crystallographic data at high spatial resolution. A better explanation is needed here. -A good explanation of the interpretation of pigments using this technique is provided. However, a better discussion of the interpretation of –C-H group data (Section 3.2.3) for organic phases can be provided. Although Raman is a ‘fingerprinting technique’, there are several publications on the subject with applications to carbonates and biominerals that could be used to improve the discussion (see references below): [1] Rutt HN, Nicola JH (1974) Raman spectra of carbonates of calcite structure. J Phys C: Solid State Phys 7: 4522-4528. [2] Edwards HGM, Villar SEJ, Jehlicka J, Munshi T (2005) FT-Raman Spectroscopic Study of Calcium-rich and Magnesium-rich Carbonate Minerals. Spectrochim Acta A 61: 2273-2280. [3] Borz-Żcka-Prokop B, Weselucha-Birczyńska A, Koszowska E (2007) MicroRaman, PXRD, EDS and microscopic investigation of magnesium calcite biomineral phases. The case of sea urchin

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8, C2062–C2065, 2011

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biominerals. J Mol Struct. 828: 80-90. [4] Hild S, Othmar M, Ziegler A (2008) Spatial distribution of calcite and amorphous calcium carbonate in the cuticle of the terrestrial crustaceans *Porcellio scaber* and *Armadillidium vulgare*. J Struct Biol 163: 100-108. [5] Tlili MM, Amor MB, Gabrielli C et al. (2001) Characterization of CaCO<sub>3</sub> hydrates by micro-Raman spectroscopy. J Raman Spectrosc 33: 10-16. -The introduction is a bit confusing trying to frame the use of a technique for biomineral characterization with OA research or other paleoclimate / paleoceanography research. I would suggest authors to revise the introduction. -Sentence on page 5566 (lines 9-12: 'Apart...') is not entirely correct. Please, revise. -References are needed at the end of line 22 on page 5568. -Sentence on page 5571 (lines 23-25) reflects some speculation. Please, revise. -Sentence on page 5573 (lines 9-11: 'These...') is only partially correct. Authors have to remind that the technique is a 'fingerprinting' one, which requires knowledge of the subject. Authors do clearly have this knowledge, but possibly it is not the case for other researchers using this technique and who are not familiar with biomineral research.

## Technical Comments:

-Please, revise the entire text as some commas are missing. Also, place 'e.g. and text' between parenthesis. -'Royal Society, 2005' (p. 55564, l. 26) is not a proper citation. -References have to be by year instead of by alphabetical order in the main body of text. -Please, revise the English in the first paragraph of page 5566 (for example, it should be CRM represents instead of 'CRM represent'). -A specific mention of scale bars has to be placed in the caption of Fig. 2, since they are quite small in figures b-d. -Figs. 3a-f are too small. Please, provide a better version of Fig. 3.

I will be glad to discuss any aspect of this revision with authors and to provide any help requested by the editor. Also, I do not want to remain anonymous.

Sincerely yours,

Alberto Perez-Huerta

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