

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2021-332

Anonymous Referee #2

Referee comment on "Fossilization of Precambrian microfossils in the Volyn pegmatite, Ukraine" by Gerhard Franz et al., Biogeosciences Discuss.,
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The manuscript entitled "Fossilization of Precambrian microfossils in the Volyn pegmatite, Ukraine" describes a very interesting and serious study, achieving its conclusions through multiple imaging and analytical techniques. I would thus recommend its acceptance for publication in Biogeosciences after minor modifications.

By reading the manuscript, I have realised that I have no more the complete expertise I once had on this topic. I am thus not able to make full comments on the Discussion (I will trust the first referee on this point) and will focus my comments on the technical parts.

One of my main comments is that I had difficulties to understand on which type of sample the study was made of, and what was the type microfossils identified.

- L21 + L49 + L 603 : I found the wording "soft tissue (micro)fossils" a little bit confusing. By reading "tissue", I assumed it would deal at some point with multicellular organisms, but it doesn't seem to be the case eventually. A rewording (e.g. using "microfossils" throughout the text could easily avoid this confusion

It would be useful to give more information on the samples from which the microfossils are coming from, by adding a few figures :

- L23 : it could be interesting to show the miarolitic cavities

- L96 : for clarity, could it be possible to add a context map to the map of the Ukrainian shield (geographical or political borders), to help the reader to understand where the sampled site is ?

- L105 : In order to help the reader to understand where the microfossils have been found, could it be possible to add pictures on the rocks sampled, or of the rock outcrops

Other comments :

- L51 : could the authors add a few references on microfossils found in pores or fissures ?

- L85 : I would suggest to use the "OM" abbreviation only when talking about organic matter chemistry (e.g. L63) and not when mentioning the microfossils morphology (see also L160, L199). Maybe the authors could use "organic remains" or "microfossils" instead.

- L121 : "without a structure of the commonly applied Au coating" : do the authors mean the cracks that can be seen with Au coating ? If so, please rephrase for clarity

- L127 (and throughout the text) : I would suggest to replace "fibers" by "filamentous microfossils"

- L131 : Transmission electron microscopy is mentioned in the abstract, and TEM results on FIB foils are shown in the Results, but the procedures are missing.

What follows are comments on specific figures, for which I am not convinced by the interpretation the authors are making. It doesn't affect the overall finding of the manuscript: it could instead gain strength by modifying or removing figures that are artefacts in my opinion.

- L158 & L159 : I am not convinced by what the Fig. 2a and 2c are showing and by the identifications made by the authors of the structures seen in these figures. Especially on Fig 3c, dark structures are described as flaky OM. In my opinion these structures could be anything, and most likely contamination. If these are actual organic remains, the authors should add proofs showing their syngenicity.

- L169 : Fig 3b, no clear link can be seen between the particle and the filament, so it could be anything, and possibly a contamination

- L198 : I am not convinced by the interpretation that the authors are making from Figs. 4b and 4c. If it is degassing, the authors should provide a reference in support for this.

- L204 : I had difficulties to see the common points between the filamentous microfossils shown on Fig. 5, which seem to me to be fully mineralised, and the filaments shown in Fig. 7 or Fig. 11 where only the outer part of the filament have been fossilised. This point needs to be clarified

- L170, about Fig SI1 : it would be clearer if the EDX spectra were at the same X scale, and the if labels of the peaks were easier to read

- L174, about Fig SI1 : The Ir peak in EDC spectra is broad, as can be seen on spectra a , b, d, orf . A thinner peak (as seen on c) looks more like a P peak instead

- Fig SI1 : caption : "verified"

- L210-211 : "the inner rim... some U" : this sentence is not clear, please rephrase

- L210-211 : I couldn't find the analyses with the corresponding numbers. Is it Si1 ?

- L212 : "The count rate for O decreases from the outer rim to the center" : which figure ?

- L263 : Please explain BSE (if possible in the Material and Methods section)

- L341 : the procedures for the collection of FIB foils and for the TEM analyses are missing in the Material and Methods sections. In addition, I was a little disappointed that from these FIB foils, only a couple EDX and EELS data were shown. Have the authors any high resolution images on the wall of the filaments that could show interesting details of the fossilisation process ? In addition, it would be interesting to show a SEM image of the filament on which the FIB foil was obtained