

Biogeosciences Discuss., author comment AC2
<https://doi.org/10.5194/bg-2021-332-AC2>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Reply on RC2

Gerhard Franz et al.

Author comment on "Fossilization of Precambrian microfossils in the Volyn pegmatite, Ukraine" by Gerhard Franz et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2021-332-AC2>, 2022

Authors' comments to Fossilization of Precambrian microfossils in the Volyn pegmatite, Ukraine, Gerhard Franz et al., Biogeosciences Discuss.

We thank both reviewers for their careful reading and their comments; all comments are very helpful to improve the presentation of our results!

Reviewer 2

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.

The type of sample material was listed in Table 1.

- 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 :

Ok, we will use microfossils throughout, possibly in the Introduction with the addition "without skeletal parts?"

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

If available, we can put in a photograph; if not, we will refer to a photograph in a previous paper by Lyckberg.

- 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 ?

The context map of Figure 1 of the Ukrainian shield seems ok; we will put in the city of Kiev (and possibly Shytomyr) as orientation.

- 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

See comment to the occurrence of the fossils; they were found free, not in rocks, and not in outcrops, but underground.

Other comments :

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

Yes, review paper by Invarsson et al. 2020.

- 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.

Ok, will be changed.

- 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

The common procedure to make such material suitable for SEM (without charging the surface) is coating; mostly with carbon, which is clearly not appropriate for organic matter, or with gold. However, going to the nanoscale, the gold-coating shows a certain irregular structure, which does not allow to see the surface of the material to be investigated. Iridium coating does not show this effect.

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

Ok, see above.

- 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.

See comment to Line 341, TEM!

- 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.

We can show images at high magnification in Figure 2, also the EDS spectra, which shows similar composition and surface structure as the other filamentous and spherical OM.

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

Comparison with Fig. 3a shows that how the particles are attached to the surface. We agree that in Fig. 3b this cannot be seen, but since it shows a similar composition as the other particles (silicates) a contamination is unlikely. Also note that loosely adhering contaminations are generally blown off with a focused electron beam.

- 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.

Clearly, this is our interpretation, and this will be made clear in the revision. What else could this porosity be?

- 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

Clarification: Fig. 5 shows filaments which consist completely of organic matter, only the outermost parts are mineralized.

- 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

Note that in the pdf of the supplement the figure can be enlarged easily to see the labels clearly, the resolution is good enough. If all spectra were at the identical X scale, some of the minor peaks would not show up, or large peaks would all show as rather broad peaks, cut in the middle, which does not allow to see their maxima.

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

Yes, we stated in the manuscript that Ir and P peaks are quite difficult to separate.

- Fig SI1 : caption : "verified"

Ok

- 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 ?

We did not include the EDS spectra; this can be done as a supplementary figure or included in Fig. 5.

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

Ok, will be done in the Methods section = back scattered electron.

- 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.

We agree with Reviewer 2 that the TEM results are somehow disappointing, as they did not show more details of the silicification of the rim. However, TEM data independently confirm the analytical data obtained by microprobe analyses and the amorphous character of kerite (which is indirectly seen via weak fluorescence in Fig. 6a). Therefore we propose to either add the necessary details about the procedures (comment to Line 131) or to shift the whole TEM chapter into the Supplementary Information.