

Report on “Short communication: Synchrotron-based elemental mapping of 1 single grains to investigate variable infrared-radiofluorescence 2 emissions for luminescence dating”

It is good to see that authors have significantly improvised the earlier version of manuscript. They have revised and clarified most of the scientific inconsistencies. The manuscript now reads well, measurement, results, and discussions are linked properly. There are several important aspects of manuscript, which will be useful for luminescence studies in future. The authors have done hard work in conducting measurements of individual grains and conducting measurements at sub-microscopic level for each grain. The finding related to correlation of elemental concentrations with anomalous IR-RF signal is interesting and needs further explorations. Thus, I feel manuscript should be published.

Although the major findings are interesting, yet I feel that manuscript still needs improvement in the English and clarity on scientific statements. I would like to encourage authors to read and write carefully to remove the inconsistencies. My comments are given below and points out some of the mentioned contradictions.

Comments

1. Line 43 (dose (Gy))
2. Line 44 sampled sediments
3. Line 71, predicted instead of assumed
4. Line 76, It will be good to state some reasons which could be leading to the variabilities rather than just mention a term.
5. Line 78, “what...” either put ? in end or rephrase
6. Line 86, “identification.....” Is it right to presume and specify signal as contamination without justifying it. You may say that u-XRF and u-Xanes have capabilities to identify defects and isolate signals but presuming that it’s a contaminating signal is not right without proving.
7. Line 97 “Though bothgeochemistry. ” Authors pointed out important aspect in this statement that both crystallography as well as geochemistry is playing a role here but they are only focusing of geochemistry. So how it is justified to attribute the current study observations only to geochemistry without considering crystallography?
8. Line 103 “Other reactions.....”. why do you say so??? May be it does not participate that’s why not observed. I think it’s better to rephrase as "involving higher oxidation states might be playing a role but not observed or suggested"
9. Line 122 “Such a contribution....De. ” In this case relative intensities play a vital role. If authors say it is only 5%, then it shouldn't significantly effect estimated dose. Please see numbers very carefully.
10. Line 144 “between one and three grain.” Is ‘and’ right here?
11. Line 174-176 “We paid particular attention.....” Do you mean other regions are not responding to IRRF? what about other regions? How are you sure that these regions are responsible for anomalies.
What about IR RF characteristics of Na? Is it not important?
Na/K Feldspar normally are dominant remnants in feldspar separation process.
12. Line 231-232 “We hypothesized.....”. How good is this hypothesis. Is it not creating biasing? Normally Fe coating on the grains can be dissolved by long HCl treatment as suggested by

Jayangondaperumal et al., 2012. Does that not mean that it may not be the external Fe coating? Sometimes K-Feldspar also has a pinkish hue and Na-Feldspar is white. Hope this is not creating an issue for authors as Na is not being measured in current methods.

13. Line 240-241, "Note that...." I raised this concern in my earlier comments also and didn't get a satisfactory answer for this. Please refer comment 29. If Fe is in coating, it can be dissolved by HCl/HF treatment. If it is in the volume and goes as high as 10% then it should be part of stoichiometry formula as is the case with K. This can change the interpretations. Authors must see to this aspect.
14. Line 240-241 "Between 10 to 30....." I know it's difficult, but it is really important to establish the mineralogy of these grains. As authors used transparent shiny and pinkish white grains, which could be Na Feldspar and K-Feldspar respectively. This could really affect the interpretations.
15. Line 246-250: How do the manual picking and optical microscope observations relate with respect to i) , ii) and iii).
16. Line 273-276 "Further....." It is difficult to accept that it is pure K-Feldspar. How does the correlation stand for K%? Please verify on some standard sample.
This is a hypothesis, and it is difficult to justify unless it is quantified. At present, we can only relate it to the color, which authors are expecting due to Fe content. The authors must understand even K-Feldspar has a pinkish appearance and Na-Feldspar has a whitish appearance. Although other colors do exist. Therefore, it may not be right to attribute the color to Fe content without quantification.
17. Line 284-285 "grains displaying...." This statement indicates that elemental concentrations of K, Pb, Fe and Ba are not representative IR RF signals and should not be correlated to signal shape. On the other hand, Ca, Ti, Mn may be related.