

Geochronology Discuss., referee comment RC2
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Comment on gchron-2020-43

Anonymous Referee #2

Referee comment on "Spatially Resolved Infrared Radiofluorescence: Single-grain K-feldspar Dating using CCD Imaging" by Dirk Mittelstraß and Sebastian Kreutzer, Geochronology Discuss., <https://doi.org/10.5194/gchron-2020-43-RC2>, 2021

General comments

The paper from Dirk Mittelstraß and Sebastian Kreutzer entitled "Spatially Resolved Infrared Radiofluorescence: Single-grain K-feldspar Dating using CCD Imaging" appears as an experimental or technical report on the instrumental prerequisites for spatially resolved Infra-Red Radiofluorescence (IR-RF). It is a pure factual description of many technical aspects. The authors promise to give full access to experimental details which should be of great interest for further investigations in this field.

It should be emphasised that the paper does not deal with all the issues necessary for age determination, it is focused on the reliable determination of D_e values by IR-RF on a set of single K-feldspar grains.

The paper is written in a clear and understandable way. Many technical details are given; theoretical principles are summarised in the appendix. The list of references includes the most important investigations of the investigated topic. I was particularly pleased by the fact that the authors digged for the first publication on spatially resolved IR-RF by M.Krbetschek (although it was only a conference contribution).

Specific comments

There are just a few remarks and/or questions which should be considered in the final version of this paper:

- the bright spots were associated by the authors with bremsstrahlung photons from the beta source. To my knowledge, M.Krbetschek correlated this effect with energy deposition from cosmic radiation (muon component). Was this idea checked? Are there arguments against this idea?
- Figure 3: the before/after picture for step 2 (image alignment) requires some explanation. A blurry picture is presented as an improvement, this is not understandable at first glance.
- Concerning the discussion about the D_e distribution of BDX16651: Dosimetric aspects should be more discussed. The existence of a broad D_e distribution does not necessarily

result in a broad age distribution, if the K content varies from grain to grain. Here spectrometric methods for the K determination of single grains could help, e.g. far-red radiophosphorescence (Dütsch, C., Krbetschek, M.R., 1997. New methods for a better K-40 internal dose rate determination. Radiation Measurements 27, 377-381. and Krbetschek, M.R., Goetze, J, Irmer, G., Rieser, U. and Trautmann, T., 2002. The red luminescence emission of feldspar and its wavelength dependence on K, Na, Ca-composition. Mineralogy and Petrology 76, 167-177.)

- In Sec. 4.1 the proposed mirror is called in the text "parabolic" but in the picture "spherical". What is correct? And - would it be beneficial to use an elliptical mirror with camera and sample in the focuses?
- Although the main goal of the paper are technical aspects, in Sec. 4.2 the authors should give a list of problems to be solved before the method can be used for "real" dating purposes.

Technical comments

Besides these notes, some additional technical comments can be found directly in the attached copy of the paper.

Please also note the supplement to this comment:

<https://gchron.copernicus.org/preprints/gchron-2020-43/gchron-2020-43-RC2-supplement.pdf>