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Interactive comment on "A spectral library for laser-induced fluorescence analysis as a tool for rare earth element identification" *by* Margret C. Fuchs et al.

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The submitted work is a contribution to a highly interesting and important topic. Rare earth elements (REE), especially the heavy ones are still urgently needed; a dependency of the raw materials on a few countries has accelerated global exploration. The "fast" analysis of these elements, e.g. in drill cores, rock walls, alluvial sediments etc. is therefore of particular importance. The present manuscript framing the already stored dataset is focused on the identification of rare earth element by laser-induced fluorescence analysis (LiF). The working approach is the systematic analysis of pure REE phosphates, which in turn represent standards for EMP analyzes. The aim is to

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Discussion paper

qualitatively record natural minerals from the results obtained. Despite promising, published work, there is a lack of systematic LiF studies of REE phosphates in the area of raw material acquisition. The presented work is supposed to fill this lack and does it. The work is structured logically and consistently, the methodology and results are well explained and documented, even for readers who are not specialized. There is a clear distinction to more recent work (e.g. Seidel et al. 2019), in which authors of the present study were involved. The new and positive thing about the present work is the systematic approach and the use of three lasers (325, 442, 532nm). Seidel et al. used only two lasers. In addition, the recording over a very large spectral range (340-1080nm) makes the work important, too. The selection of the samples is of particular importance, they are international standards (Smithsonian EMPA standards). In addition to embedded samples, single grains are also analyzed, which is important as embedding agents create overlapping. The description of the laser used and the application to the individual REE phosphates is detailed, clear and easy to understand for users. The investigations are performed meticulous. To my knowledge, published and cited LiF works and data collections for naturally occurring samples are not so systematic, element-selective, of the same high resolution and methodically differentiated. The work ends with the application to a naturally occurring HREE phosphate (Xenotime). A supplement to other REE minerals, such as REE carbonates, which also occur frequently, would be desirable. This is a suggestion for future work, not a criticism of the present work. The significance of the submitted manuscript is extremely high. It is a very helpful tool and unique in its completeness. It represents the basis for various options, especially in the raw material sector. For example, a relatively quick scanning of drill cores, handpieces or open pits can test the material for increased REE contents. The utility is then primarily an applied one. However, the data set can also serve as a basis for further research, e.g. the recording of carbonaceous REE minerals

The data and images described in the manuscript correlate perfectly with the data set that has already been saved - this means that they can be checked or used for other applications. The summarizing figure (Fig. 10), will help the user choosing the best

laser wavelength for the subject. A specific quantitative analysis is not given, yet. But this is beyond the scope of the project

In my opinion, this is a very professional study. The choice and combination of different lasers and samples (artificial mounds and single grains as well as natural samples) is excellent and really brings new results. Again, the text is extremely well written and very understandable and comprehensible for LiF non-professionals. Text and database correlate very well. Except for some small orthographic errors, I don't see any point of criticism.

I rate the presented work with 1

To be checked/corrected Abstract: line 3 I would add . . .and minerals to . . ..such as rocks. . .. p. 2 line 64: ..are instead of is?

p.4: line 42/43: . . . multiplied by 0. I am not sure if 0 is ok

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