

The opinion on the doctoral dissertation titled
“Utilization of the Bauxite residue to Recover Scandium Rare Earth
Element”

by Ali Dawood Salman

-The dissertation's theme is very much up to date, because the reprocessing of Red Mud in order to get valuable constituents from it is very much important because of many reasons, especially that the concentration of Scandium is generally speaking higher, or much higher than that of the natural mine of this element. This statement is true for many REMs.

-The dissertation in referring to 146 pieces of literature, although 5 are his own papers.. The level of the literature study is outstandingly good, clear, and detailed up to the optimal level.

The chapter called Introduction is the literature study (22 pages) and the Scope of work (2 pages). It is a rather unusual solution, but acceptable one.

-The dissertation contains a wide variety of preludes for the research in the literature, all of them are interesting resources.

-The literature is analyzed deeply detailed with the necessary criticism.

-The goals for the research seemed to be based on literature study and the previous research made by the research group and the applicant.

-The experimental methods selected by the researcher are adequate and full. The methods are completely applicable to accomplish the goals targeted.

-The methods used during the research are, generally speaking, up to date for the themes.

-The application of x-ray fluorescence is well used, but the exactness of the results are a bit questionable, because the relative exactness reached seems to be a bit uncertain. The reviewer senses some necessity on the analysis of the exactness of XRF measurements.

-The levels of the processing of research results are quite high, used all of the necessary mathematical problem solutions, applicable here, including mathematical statistics methods. This is very important, because the dissertation is based on a lot of experimental work and results. Their processing is very much containing statistical analysis.

-The consequences and conclusions made by the applicant are valid containing strong mathematical and chemical evidence. Those conclusions are good to continue of the development work in the real word although the samples of the investigated materials are rather small. The possibilities of the good practical result are quite high.

-The applicant made some comparison between his own results and the literature.

-The own publication activity of the applicant is now seen at all in the version of that received by the reviewer. He quoted 7 publications in high level international journals with the impact factor between 1,7 and 9,9.

-The new scientific results are given in 3 major points (5.1., 5.2., and 5.3), with altogether 6 subpoints.

All are acceptable, and supported properly by experimental results, but the reviewer can not see evidence, that they were supported by papers, presentations, and anything similar.

-The dissertation is consisting of 5 major chapters and a Bibliography, and some additional appendices showing tables, graphs and mathematical model surfaces.

-The construction of the dissertation is clear and easy to read. The figures, and graphs are having extraordinarily good quality. The literatures are referred very well and in order, clearly and informatively.

-The style of the dissertation is outstanding, and following the rules precisely.

- The reviewer accept all of the thesis points and subpoints as new scientific results, and suggests to the committee to accept them also, and give the doctor degree for the applicant.

Questions:

1. According to some preliminary experiments, when the RM is treated by arc furnace technology, the Scandium is moving to the sludge, and the initial concentration is doubled. What is the method tried by you is the best to treat those samples (in the sludge containing even metallic iron)? It can be worthwhile or not?
2. As the title of the dissertation is containing the word bauxite, the question arises that if the goal is to get scandium, is not sensible to try to get that metal directly from bauxite. What is your opinion about that? Is that more difficult, or easy?
3. In the majority of the scandium ore mines the normal scandium concentration is lower that can be measured in red mud. What was the highest initial scandium concentration you ever tried?
4. How many thesis points are supposed 3, or 6? All are based properly with experimental and modelling results and by publication and stand individually, too. For the reviewer both number is acceptable.

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