**Appendix 12b**

**REPORT**

of dissertation for the acquisition of:

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|---|---|
| educational and scientific degree " **doctor** " | |
| scientific degree **"Doctor of Science"** | X |
| | the true is indicated by the sign "X" |

**Author of the dissertation**:

| | | | | | |
|---|---|---|---|---|---|
| Assoc. prof. | PhD | Maria | Atanassova | Petrova | UNIVERSITY OF CHEMICAL TECHNOLOGY AND METALLURGY, Sofia |
| academic position | scientific degree | name | middle name | last name | workplace |

**Topic of the dissertation**:

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|---|
| Synergistic solvent extraction of lanthanoids using a combination of chelating and organophosphorus ligands: from ancient beginnings to modern scientific chefs-d' oeuvre |

**Scientific area**:

| | |
|---|---|
| 4 | Natural Sciences, Mathematic and Informatic |
| code | name |

**Professional area**:

| | |
|---|---|
| 4.2 | Chemical Sciences |
| code | name |

**Scientific specialty**:

| |
|---|
| Inorganic Chemistry |

**The report was written by**:

| | | | | | |
|---|---|---|---|---|---|
| Prof. | DSc | Vladimir | Dimtchev | Dimitrov | IOCCP-BAS |
| academic position | scientific degree | name | middle name | last name | workplace |

**1. Meeting the minimum requirements under the Regulations:**

| | | |
|---|---|---|
| A) The candidate meets the minimum requirements | 20 points | X |
| B) The candidate doesn't meet the minimum requirements | 0 points | |
| | | one of the answers given is marked with the sign "X" |

| |
|---|
| It is mandatory to fill in if answer B is marked. The publication activity of the candidate is analyzed. The response of the results achieved (quoted) is analyzed. |
| |

**2. The relevance of the topic of the dissertation:**

| | | |
|---|---|---|
| A) The topic is relevant and new (there are no known results on the topic by other authors) | 8 points | |
| B) The topic is relevant and results from other authors are known | 6 points | X |
| C) The topic is not relevant, but results from other authors are known | 2 points | |
| D) The topic is not relevant and no results from other authors are known | 1 point | |
| E) The topic does not correspond to the level of dissertation | 0 points | |
| | | one of the answers given is marked with the sign "X" |

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| The evaluation of the relevance of the dissertation must be substantiated |
| The elements in the lanthanide row (so-called rare earth elements) are applied in various modern technologies, due to which the need to obtain them in the purest possible form is constantly growing. A current method for separation and isolation of lanthanide elements is liquid-liquid extraction with the use of suitable complexing agents and solvents. The results published in the literature present promising guidelines for development and opportunities for the deployment of future industrially applicable technologies. |

**3. Type of research:**

| | | |
|---|---|---|
| A) Theoretical | 4 points | |
| B) Applied | 4 points | |
| C) Theoretical with application elements | 4 points | X |
| D) It does not correspond to the level of dissertation | 0 points | |
| | | one of the answers given is marked with the sign "X" |

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| The level of research must be substantiated if answer D is marked. |
| |

**4. Objectives of the research:**

| | | |
|---|---|---|
| A) Realistic and of scientific and / or applied interest | 8 points | X |
| B) Realistic, but not of scientific and / or applied interest | 3 points | |
| C) Unattainable (unrealistic) | 0 points | |
| | | one of the answers given is marked with the sign "X" |

| Objectives must be specified. The type of the set objectives must be justified. |
|---|
| The aim of the planned development is to study the possibilities for extraction of complexes of rare earth elements with suitable ligands (mainly of β-diketonate type) in suitable solvents by the addition of a reagent acting as a synergist. In general, the goals and objectives set by the dissertation are realistic, but are formulated too voluminous, which leads to significant defocus and difficult to follow the logical sequence. |

**5. Contributions of the dissertation:**

| | | |
|---|---|---|
| A) With lasting scientific and / or applied response, they form the basis for new research and applications | 20 points | |
| B) They are of significant scientific and / or applied interest, complete and / or summarize previous research | 16 points | X |
| C) They are of scientific and / or applied interest | 12 points | |
| D) Lack of significant contributions | 8 points | |
| E) Lack of contributions | 0 points | |
| | | one of the answers given is marked with the sign "X" |

| Contributions must be specified. The type of results achieved must be justified. |
|---|
| The 5 main scientific contributions formulated by the dissertation reflect in principle the results of the conducted experiments and the conclusions drawn from them. The summaries are of interest to the international scientific community, as evidenced by publications in renowned journals, as well as participation in conferences. Possible future applied interest can be identified in the results. |

**6. Conclusion**

| | | |
|---|---|---|
| A) The evaluation of the dissertation is **POSITIVE** | This evaluation is assigned to a total number of at least 40 points | X |
| B) The evaluation of the dissertation is **NEGATIVE** | This evaluation is assigned to a total number below 40 points | |
| | | one of the answers given is marked with the sign "X" |

| To be filled in at the request of the member of the scientific jury |
|---|
| The goals of the dissertation field are placed in a topical and perspective field of chemistry. Significant experimental work has been done, the results of which are summarized in a significant number of scientific publications covered in the dissertation. The general conclusion of the materials submitted for evaluation is definitely positive. However, it is necessary to note some remarks that I hope will be useful to Dr. Maria Atanasova Petrova in her future work.<br>• The dissertation and the abstract are too long (285 pages of the dissertation and 65 pages of the abstract). There are superfluous descriptions, which, although of general educational interest, divert the reader from the most important in the work. Long descriptive sentences are used, in which ambiguities, inaccuracies are sometimes allowed and the logical meaning of the statement is lost. The dissertation would benefit from a focused presentation summarizing the most significant results.<br>• More attention should be paid to the terminology in Bulgarian language – this, of course, is often difficult, but should not be underestimated. For example the term "синергентна екстракция" does not exist in the Bulgarian language; "синергентен" is not an accurate translation of the English term "synergistic". The |

term "синергентен" is found in Russian-language publications, although there is no linguistically correct translation. I would not like to give other examples here, but I would like to share them with the dissertation in another occasion.

- I would advise to avoid the wording "done for the first time". This advice is a must in most international journals.

In any case, if I focus only on the achieved experimental results and formulated summaries, the value of which does not decrease from the remarks, I would definitely like to express by the distinguished scientific jury my support of the dissertation for granting the degree "Doctor of Science" to Assoc. Dr. Maria Atanasova Petrova.

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| **19.06.2022** | The report was written by:<br><br>**Prof. DSc Vladimir Dimitrov** | Vladimir Dimitrov<br>DN: cn=Vladimir Dimitrov, o=Institute of Organic Chemistry with Centre of Phytochemistry, email=vladimir.dimitrov@orgchm.bas.bg, c=BG |
| date | | signature |