

**CHARLES UNIVERSITY
FACULTY OF PHARMACY IN HRADEC KRALOVE**

Department Pharmaceutical Chemistry and Pharmaceutical Analysis

Study program: Pharmacy

Opinion of the Opponent of the Diploma Thesis

Year of the defense: 2024

Student: **Jorge Lozano Cañadilla**
Thesis Tutor: Prof. PharmDr. Petr Zimčik Ph.D.
Consultant:
Opponent: Doc PharmDr. Miroslav Miletín, Ph.D.
Thesis title: **Synthesis of anionic phthalocyanines**

Scope of work, number of 42 pages, 21 figures, 0 tables, 46 citations

Evaluation of the work:

- | | |
|---|-----------|
| a) Processing of the theoretical part: | Very good |
| b) The complexity of the methods used: | Excellent |
| c) Preparation of the methodological part (clarity, comprehensibility): | Good |
| d) The quality of the experimental data obtained: | Very good |
| e) Processing of results (clarity): | Very good |
| f) Evaluation of results, including statistical analysis: | Very good |
| g) Discussion of results: | Very good |
| h) Clarity, conciseness, and adequacy of conclusions: | Very good |
| i) Meeting the objectives of the work: | Very good |
| j) Quantity and up to date of references: | Excellent |
| k) Language level (stylistic and grammatical level): | Very good |
| l) Formal level of the work (text structure, graphic design): | Good |

I recommend the thesis for recognition as a rigorous thesis

Comments on the evaluation:

Student Jorge Lozano Cañadilla elaborated a diploma thesis titled Synthesis of anionic phthalocyanines. The aim of the study was to synthesize formerly already prepared anionic phthalocyanines bearing carboxylic groups to enable their water solubility and/or to be able to bind to a specific target. The task of the diploma thesis was also possible optimization of the syntheses to obtain better yields.

The thesis is arranged almost in the usual way, with only some part missing or short. Introduction chapter includes literature search part in areas of photodynamic therapy, photosensitizers and especially phthalocyanines, concerning their syntheses and modifications. In the Experimental part the syntheses of target compounds are described, discussing procedures changes potentially improving final yields (but it was not confirmed). The prepared compounds are characterized by physical and spectral methods. Methodology part is missing, methods of synthesis are discussed together with yields, etc. in chapter Discussion of the results. In Conclusion part outcomes of the thesis are very shortly summarized. The work is not formally and graphically perfect, with deficiencies, some of which are listed below. I have some comments and question for the student.

Questions and comments to student:

Comments, errors and typos:

Not all pages have the text equally aligned to the margins; missing space (p. 21); there are some typos like e.g. ...hematoporphyrins (p. 13) ..., ...porfirins...(p. 17), twice ...dimethyl...(p. 22), etc.

Fig. 3, 4 are of a low quality. Fig. 5 and 10, Scheme 1, structures on page 29: There are different characters and sizes of letters and bonds in the structural formulas.

Page 14: Four last paragraphs are not very related to the thesis topic.

Experimental section: Descriptions of preparations do not have numbers, as is usual and good for orientation in the work.

Generally in Thesis: Inconsistently written spaces for % and degrees Celsius.

Fig. 18: The legend is on another page than the figure

Questions:

What can be advantage of use blue light in PDT?

Page 13: Could you explain the mechanism of ALA more in details? What is the ferrochelatase function? What is exactly the critical point (bottleneck) in the heme biosynthesis? Does the ALA work also in non-cancer cells?

Page 16, part Bacteriochlorins: How is the process of a photosensitizer degradation by light called? What means...union of dimethyl...?

Page 18: Do you know the rule which characterizes the influence of the central atom in Pc core on the photodynamic activity?

Page 22: Which method was used for comparison with standard?

Page 23: The procedure is not quite clearly described: ...the residue was extracted by ethyl acetate... Product was extracted into solvent and solvent evaporated or the product was the rest after evaporation? Specify the procedure.

Page 25: The ratio of methanol and water was v/v or m/m? It can influence the saturated NaOH concentration.

Page 30, last paragraph: The organic phase was dried or evaporated?

Page 35, second paragraph: The name of the extraction organic solvent is wrong, specify it correctly.

Page 35, fourth paragraph: The silica with the product was evaporated? Explain the procedure.

From a scientific point of view, the thesis is of an average level. The experimental work is not very extensive. However, useful product were prepared and synthesis methods modifications tested and the work brings contribution to the project in the research group. As such the Thesis meets the requirements for qualification work of this type and I recommend it for the defence.

Evaluation of the thesis: Very good

**For the
defense:**

Recommend

In Hradec Kralove

29. května
2024

signature of the opponent