

External examiner's review of a Master's thesis

Student's name and surname: Leul Mekonnen Belay
Degree programme: Environmental engineering
Degree course: N0712A030002 Environmental Engineering
Specialization
(if the degree course is divided into specializations):
Department: Department of Environmental Protection Engineering
Supervisor of the Master's thesis: Ing. Štěpán Vinter, Ph.D.
External examiner of the Master's thesis: Ing. Jaroslav Filip, Ph.D.
Academic year: 2023/2024

Title of the Master's thesis:
Stabilization and Solidification of Industrial Waste

Assessment of the Master's thesis using the ECTS grading scale:

Assessment criteria	Assessment according to the ECTS
1. Fulfilment of the assignment criteria	A – Excellent
2. Level of quality of the formal aspects of the thesis, including the level of linguistic quality	C – Good
3. Amount, topicality and relevance of the literature sources consulted	B – Very good
4. Description of experiments and implementation methods	B – Very good
5. Level of quality of processing of the results	B – Very good
6. Interpretation of the results achieved and discussion thereof	B – Very good
7. Formulation of the conclusion of the thesis	A – Excellent

I recommend the submitted thesis for defence and propose the following assessment:

B – Very good

Comments on the Master's thesis:

The master's thesis submitted by Leul Mekoned Belay investigates various methods of stabilization/solidification (S/S) of hazardous waste, which is very actual and practically-oriented. The theoretical part, while sometimes too descriptive (for example, Table 3 should be easily omitted), is focused on toxic metals in hazardous wastes, solidification/stabilization methods using cementation and impact of chlorides. Few notes regarding the content: it is not usual to number the first chapter in the theoretical part with number 2; in chapter 3 the statement "Convenience ... contribute significantly to increased usage of land disposal." is supported by a 1987 reference - more recent information would be more appropriate; Chapter 5 focuses of interaction of previously solidified bodies with chlorides, instead of impact of chlorides on S/S process itself (which is studied in the thesis); small-size waste (page 43) is supposed to mean small particle size waste or small volume wastes?; statement "The TCLP extract is the liquid that remains after being filtered..." (page 43) is confusing. Extract is a liquid residuum after the extraction, not after the filtration; statement "An extraction fluid selection is necessary based on the solid waste alkalinity." implies that there is no acidic waste, in general. The form of the theoretical part is characterized by partially low comprehensiveness, for example: page 29 – "Other ... metals... are toxic and have no effect on living thing" is contradiction; page 33 – the meaning of "The fluxes, impurities in the coke and iron, and the ore all affect..." is hard to catch; few times in the text the verb "lead" was inappropriately replaced by "Pb", resulting in expressions such as "Pbing" (page 25); it is not usual to number the first chapter in the theoretical part as 2; and so on. These issues persist also in the experimental part of the thesis making the thesis uneasy to read (grade C).

In the methodology description, few points should be clarified, including: from which part of the process displayed in the figure 5 the waste used in the work was taken? Were size fractions of waste (<1 and <10 mm) separated by sieving or by some other pretreatment? Is multiplication by 1000 (in eq. 1) correct when masses are in g and volume in l? Despite this, the grade is B. The achieved results are presented and discussed in a concise way. Statements are supported by figures and tables, except for Tab. 19 - the source of these data is unrevealed. It is also very confusing to use "condition" in sections 14.5 and 14.6, where apparently "method" should be used in agreement with previous sections. Hence grade B for this part. The results are comprehensively summarized in the Conclusion section (grade A) and the Master's thesis is recommended to be submitted for defence.

Questions to be asked by the external examiner of the Master's thesis:

- 1) Kindly answer the question in the "Comments on the Master's thesis" part.
- 2) Is there a suggested method for treatment of the present Ni, to achieve the landfilling requests?
- 3) TOC, DOC and TDS for AA leachate of the waste were not determined?
- 4) The presented Pb and Cu concentrations in leachates from solidified bodies are expressed relative to dry mass of total solid (W+C) or only W in the solidified body?
- 5) For how long waters were stored in dark or exposed to sunlight for the Method 3 sample preparation?

In Zlín on 23. 05. 2024

Signature of the external examiner of the Master's thesis