

I. IDENTIFICATION DATA

Thesis title:	Effect of Neutron Irradiation on Concrete Aggregates
Bc. Syrym Sertayev	Bc. Syrym Sertayev
Type of thesis :	master
Faculty/Institute:	Faculty of Civil Engineering (FCE)
Department:	Department of Concrete and Masonry Structures
Thesis reviewer:	Ing. Jiří Rymeš, Dr. Eng.
Reviewer's department:	Červenka Consulting s.r.o.

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
The given assignment includes both advanced experimental work and the application of the obtained findings on a complex problem, which is the degradation of concrete due to RIVE. This exceeds the usual scope of a master's thesis.	

Fulfilment of assignment	fulfilled
<i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	
The data of baseline characterisation of aggregates are given in the thesis. The theoretical part of the thesis describes the effect of neutron irradiation on aggregates in sufficient detail.	

Methodology	correct
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The applied methods are correct and are adequate for obtaining thorough mineralogical characterisation of the aggregates.	

Technical level	A - excellent.
<i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	
In the theoretical part, the state-of-the-art is well described. The information from the less common but apparently relevant Russian literature (Denisov et al., 2012) is very interesting.	

Formal and language level, scope of thesis	A - excellent.
<i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	
Correct.	

Selection of sources, citation correctness	A - excellent.
<i>Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?</i>	
As written above, the references are adequate and sufficient. The literature review covers mainly Russian, Japanese, and Czech sources. The citation style is correct.	

Additional commentary and evaluation (optional)	
<i>Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.</i>	
The thesis describes works on non-irradiated samples and on samples irradiated in Institute for Energy (IFE), Norway. Suddenly, chapter 4.2 <i>Irradiation in research reactor LVR-15</i> describes irradiation of a different sample set, which is yet to	

be examined. Although this chapter is interesting and informative, I do not think it fits into an otherwise coherent description of already conducted experiments

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.

Bc. Syrym Sertayev submitted an interesting master's thesis. The theoretical part is written in great detail, and the author cites plenty of relevant sources. The experimental part gives a comprehensive baseline characterisation of non-irradiated and irradiated rock samples. The applied techniques such as XRD/Rietveld analysis, SEM-EDS, FTIR/Raman spectroscopies represent the current state-of-the-art method available in the field of mineralogy. The data are of high-quality and presented in enough detail.

I suggest that the following topics can be further discussed during the final defense:

- 1) The method for calculating porosity is based on the ratio of the density obtained by the Archimedes method and helium pycnometer. It is claimed that the porosity and cracks were not saturated by water during the Archimedes method measurement of density. How was this controlled/checked? Furthermore, why was this method chosen over measuring the porosity only by the Archimedes method but using samples after full saturation?
- 2) As mentioned in the thesis, the XRD/Rietveld data showed reversed trend in the amount of amorphous phase and the unit cell dimensions for samples E07, E08, F07, F08 compared to samples E13, E14, F13, F14. Are there any hints in the other data (density, porosity, etc.) supporting/disproving the trend of XRD/Rietveld data?
- 3) It is argued that the discrepancy in XRD/Rietveld data could originate from the "sophisticated examination by Rietveld analysis." To further discuss this topic, it would be interesting to present more details from the Rietveld refinement, such as a comparison of the measured and fitted spectra or some quantification of the goodness of fit?
- 4) As the theoretical part focuses on the description of the mechanism and consequences of the aggregate irradiation and not on the theoretical background of the applied experimental methods, some of the experimental techniques can be explained in more detail.
- 5) It is not clear how data in Figure 5.1.7.6. were obtained. Do the crystal lattice parameters represent the average value from up to 4 samples subjected to a given fluence? Or do they come from one chosen rock?

The grade that I award for the thesis is **A - excellent**.

Date: **30.1.2021**

Signature:

