

Opponent's review of the Doctoral Thesis

Candidate Pavla BauerováTitle of the doctoral thesis Characterisation of Czech Modern Mosaic MortarsStudy Programme Civil EngineeringTutor doc. Ing. Martin Keppert, Ph.D.Opponent Ing. Renata Tišlová, Ph.D.e-mail renata.tislova@upce.cz

Topicality of the doctoral thesis theme

Commentary: The topicality of the thesis can be assessed as average to above average. The research of mosaics, especially from the ancient or medieval period, is the subject of long-term research interest. The modern mosaics from the 19th and 20th centuries are less under the scientific scope but these have also been the subject of research for the past 15 years. In our country, many research projects have been carried out on modern mosaics; quality and informed restoration interventions are taking place in the field based on quality surveys (including research on laying/fixing mortars) and the rescue of this previously underestimated cultural heritage group. The methods of their analysis presented in this thesis are also familiar as they are based on the quite common spectrum of research methods used to study different kinds of mortars. For the interpretation of the results, it is necessary to have a deeper insight into the traditional mosaic techniques, which is also presented in the thesis. In this context, the experimental chapter (Chapter 7) on determining the content of the linseed oils in the mosaic bed mortars is undoubtedly a superstructure and an above-standard contribution to the work.

Therefore, the work's main contribution lies in the collected amount of data and information, which has not been published to this extent on mosaics of the 19th and 20th centuries until today. The data are interesting from many points of view - it helps to get a general more profound knowledge of the technique and material background, they get the information of contemporary traditions and materials in our territory, which can be compared with other objects in and out of the country. In our territory, the work is beneficial for mapping the work of individual workshops or active artists during this period.

excellent above average average below average poor

Fulfilment of the doctoral thesis objectives

Commentary: All the objectives of the doctoral thesis were fulfilled with only a tiny comment concerning one of the objectives, which was the identification of possible workshop-specific markers in fixing techniques between different mosaic workshops operating in the Czech Lands. To fulfill this goal, it is always necessary to analyze a representative group of samples from the given author or workshop, which in the case of the doctoral thesis was only possible in two cases: A. Neuhauser's mosaics and Forster's mosaics. The objectives of the thesis could therefore focus more on detailed research of workshop techniques and authors from the end of the 19th century and the beginning of the 20th century. Socialist mosaics were created under entirely different circumstances and conditions; the material base is also completely different from older mosaics. In the thesis, it is clear, that the author received less data for detailed processing, and the level of analysis is also lower compared to older analyses of older mosaics.

This topic could be treated completely independently (outside the doctoral thesis), and more emphasis could be focused on the interpretation of the data related to the works of the turn of the 19th and 20th centuries.

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Research methods and procedures

Commentary: The analysis of mortar samples involves standard techniques such as microscopic cross-section analysis (OM, SEM-EDS), thermal analysis, and X-ray powder diffraction. However, these methods have certain limitations. For instance, in determining the phase composition using XRD, the obtained information is about the overall composition of the sample, which is the sum of the composition of the binder, aggregate, or other minor additives or inhomogeneities. During the SEM-EDS chemical analysis, in some cases (Table 10, 12, 14) the author presents average results from the sample which do not distinguish the composition of the binder, filler, and inhomogeneities (as given in Table 4) that are often indicators of the composition of the binder. As a result, the calculation of CI from the average comes with a larger error. To avoid some of these problems, the use of polarizing microscopy on polished thin sections is recommended, which the author presents only in Chapter 6.3.4 (the mosaics of the socialist period, author of the analyses: F. Pintér). The method and type of probes (polished thin sections) are much better and more accurate in terms of the identification of individual components. It allows a better knowledge of the complex composition of the sample – aggregate (mineralogical composition, origin, minor admixtures, grain sizes and distribution, the shape of the aggregate particles), binder (mineralogical composition, inhomogeneities, etc.). In addition, the method can be used to describe microstructure (e.g. porosity - the shape and size of the pores, which may vary in the presence of organic components such as oils), the presence of cracks, degradation phenomena).

I also have a few comments regarding the TG/DTG and EGA-MS curves. Some of them do not meet standard quality (e.g. Fig. 37, 38, 50a). The curves are presented in different temperature ranges - some are from 50-900°C, while others are from room temperature to 1000°C. The labels on the records also vary - some have sample codes while others do not. To follow the discussion about the effects on TG/DTG curves, it would be helpful to at least designate the maximum of the peaks on DTG curves. It is also worth considering designating the weight losses being discussed, as this would allow for the content of the individual phases to be controlled. Without this information, it is not easy to verify whether the presented data is calculated correctly.

For all of the measurements, it is unclear from the presented data how many of the mentioned measurements were conducted by the author of the doctoral thesis herself. From Chapter 6.2 it is known that a larger number of co-workers participated in the measurements. Therefore, it would be beneficial to clarify their contributions to the project.

Finally, I must appreciate Chapter 7, which deals with the possibility of determining the content of linseed oil in mortars. This chapter represents an innovative part of the mosaic bed mortar analysis, which brings an essential advanced issue to the Ph.D. thesis. The content of oil was determined using three techniques (TG coupled with EGA-MS and TOC) on a reference set of lime mortar samples with different linseed oil content. This part is excellently processed methodically and formally. The result of this part is a method for determining the oil content in mortars using EGA-MS, which can be used not only for determining the oil content in mosaic bed mortars but also for other types of mortars.

excellent above average average below average poor

Results of the doctoral thesis – dissertant's concrete achievements

Commentary: Within this thesis, Pavla Bauerová analyzed a set of 27 mosaic works. From their analysis, the author made some general conclusions about its composition and she managed to prove some trends and preferences in the mosaic bed materials used from the end of the 19th to the end of the 20th century. She succeeded especially in the case of the Neuhauser and

Foerster workshops where she proved the link to the traditional technology invented as early as the 16th century (Neuhauser). In the case of the first Czech mosaicist, Viktor Foerster, the author confirms the usage of new, progressive materials based on early Portland cement or mixtures of Portland cement and lime and crushed bricks or gypsum which further developed after his death in the continued running Foerster's studio.

The analyzed bedding mortars from mosaics produced by other early 20th-century mosaic workshops confirm the ongoing transition from traditional materials and much more complex formulas/mixtures to the application of modern materials based on Portland cement and different kinds of modern aggregates (sand, blast furnace slag, etc.).

In this context, the last group of socialist mosaics of the second half of the 20th century seems redundant, as it opens a completely new group of materials based on a completely historical context, traditions and material approach.

In addition to these specific benefits of the work, this doctoral thesis is beneficial from many other points of view. It expands the knowledge of this group of works of art, which is still on the fringes of mainstream conservation interest. A detailed knowledge of the composition of bedding mortars, which are undoubtedly the most important element affecting their stability, will influence the planning, implementation and quality of restoration interventions and the protection of these works.

Although this work is mainly of an applied nature (except for the part on the determination of the oil content, which has a positive scientific and research impact), by thematizing and pointing out the relatively neglected area of professional monument care, it opens up many partial professional topics for future research.

excellent | above average | average | below average | poor

Importance for practice and for development within a branch of science

Commentary: The work is primarily important for the practice and restoration of this group of monuments. Knowledge of techniques and materials will help in planning and carrying out restoration interventions, and choosing repair materials that will be in harmony with historical materials. Thanks to the knowledge of the composition of the fixing mortar, which is one of the main carriers of stability and determines the durability of mosaics, inappropriate and downright harmful interventions that shorten the life of these monuments will be minimized.

In terms of further contribution to the scientific field, I rate the contribution of the work as rather medium. The work does not have the character of basic research that could be significantly further developed. The topic of Pavla's Ph.D. work falls rather into the field of applied research, so the results will be more appreciated in practice or the research projects of other mosaic works.

excellent | above average | average | below average | poor

Formal layout of the doctoral thesis and the level of language used

Commentary: The comments on the formal layout relate particularly to the experimental part of the work, which is somewhat chaotically structured for the non-participating reader. In the chapters, the results of the analyzes are mixed with summaries of the results (see, for example, chap. 6.3.1.6 Summary I, 6.3.2.5 Summary II, etc.), which should be presented in a separate chapter Summary of the Results. However, the biggest problem of the experimental part is the labeling of the samples, which is not consistent in the experimental part - sample codes appear somewhere in the tables and graphs, sometimes the samples are labeled with the names of localities, e.g. Dolín – Christ, and sometimes with the names of authors or workshops (e.g. Mašková). In addition, the marking of the samples presented in the main part of the work should be linked to the catalog, which again does not have a uniform marking system (see e.g. PB1705 – Lauschmann (contains the simplified name of the monument) vs. PB1802 – Dolín (according to location)).

The language level of the work is very good both in the theoretical chapters and in more linguistically difficult passages of the experimental chapters, in which I appreciate the correct usage of professional terminology..

excellent above average average below average poor

Statement on compliance with citation ethics

without any comments

Remarks

A few individual notes on the text:

- The text mentions the cocchiopesto technique in several places, but it is incorrect since cocchiopesto is crushed brick or ceramic shards and cannot be associated with the technique.

In Chapter 3.1 Binders:

- NHLs can be produced at much lower temperatures than is written on page 5, the main constituents are belite (C2S) and lime (CaO), other phases mentioned in the text (e.g. C3A, C4AF, ..) are minor components.

3.1.2 Cocchiopesto - it is unclear why the Chapter 3.1 discussing the binders includes Cocchiopesto.

3.1.3 One of the key components responsible for the quick setting of Roman cement is the amorphous phase (poorly crystalline aluminates or aluminosilicates or dehydrated clays), which should be mentioned in the paragraph discussing the phase composition of these binders.

3.1.4 Portland cement - the chemical composition given in the text is too strict. The composition of Portland cement varies to some extent, and it would be more precise to provide some limits on the oxides. The reference needs to be included here.

6.2.5 X-ray powder diffraction - I miss the description of sample preparation and other details concerning the measurement conditions, such as the source of X-ray radiation, step, 2theta range of measurements.

- As previously mentioned, it is important to mark the samples coherently throughout the entire thesis. This will ensure consistency and clarity in the presentation of your work.

Final assessment of the doctoral thesis

average to above average

Following a successful defence of the doctoral thesis I recommend the granting of the Ph.D. degree

yes <input checked="" type="checkbox"/>	no <input type="checkbox"/>
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Date: 31.12. 2023

Opponent's signature: