
INVESTIGATION OF *IN SITU* REGENERATION POSSIBILITIES OF CARTELLINE IN CASE OF MODERN GOLD GLASS TESSERAE

BRIGITTA MÁRIA KÜRTÖSI, HUNGARIAN UNIVERSITY OF FINE ARTS, CONSERVATION DEPARTMENT, BUDAPEST, HUNGARY,
kurtosi.brigitta.maria@gmail.com

ABSTRACT

Concerning some outdoor mosaics, it is known that metal leaf tesserae can start to lose their structural unity. Firstly, micro-cracks occur in the thin covering glass (*cartellina*), and as the surface becomes discolored the refraction of light alters. Then it can detach from the gold. If the gold layer damages only the supporting glass remains embedded; thus, the tessera loses its original character. Among the causes can be the different chemical composition of the glass materials. The goal of the research is to prolong the life of these types of tesserae *in situ*, instead of substituting them during the conservation.

Keywords: metal leaf tesserae, modern mosaics, coatings, regeneration, cartellina

INTRODUCTION

The deterioration of the metal leaf tesserae is a general phenomenon concerning mainly outdoor mosaics, or fragments derive from excavations. The three-layer composite stratigraphy of metal leaf tesserae starts to lose the unity in structure. They compose of three hot fixed layers, the supporting glass, the metal leaf, and the covering glass, the *cartellina*. The degradation of these tesserae is mostly visible on the top. This research is dealing with this kind of problem occurring on modern gold leaf tesserae. The symptoms were examined on the damaged mosaics of the dome

and the pendentives South-Eastern dome of the Archways by Lajos Gerle in the Fiumei Road National Cemetery, Budapest. The mosaic ensemble out of four, was executed in 1904 by the workshop of Miksa Róth. The designer was Zsigmond Vajda painter, who have chosen the topic of the Pentecost/The Outpouring of the Holy Spirit, and the depictions of the four evangelists in the form of their iconographical attributes.

ABOUT THE CAUSES

One of the causes concerning the alteration can be the mechanical deformation of building structures. The open joints can receive continuously the rainwater and not only the frost, but the periodic movement of the water-soluble salts and the diverse heat dilatation of the materials are also responsible for the deterioration.

Under the same conditions some tesserae are in normal, general state, but some of them – which can be randomly located – are completely altered (Fig. 1).

The presence of salts accelerates the detachment of the *cartellina*. The water-soluble salts from the building materials strive towards the surface and occurs periodically in crystallized forms inducing



Fig. 1. Altered, randomly located gold leaf tesserae *in situ*. of mosaics in the dome and the pendentives by Zsigmond Vajda and Miksa Róth. In 1904. South-Eastern dome of the Archways by Lajos Gerle in the Fiumei Road National Cemetery, Budapest (photo by B. M. Kürtösi)

the appearance micro-cracks or increasing the intensity of those. The problem can start from the edges, moving from outside towards the central part of the tessera. Or the root of the problem can also develop from the different chemical composition of the glass materials used during the creation of the mosaic. Before the complete degradation of the top layer the intermediate phase is equable structural and the visual alteration of the metal leaf tesserae; the lustreless, discoloured looking is the naked-eye visible sign that the refraction of light altered. The mosaic contains both types, but the latter one is under investigation.

DISCUSSION

The goal of the ongoing research is to elongate the life of these tesserae in their original location, instead of their total substitution during the conservation-restoration process.

Epoxy-resins are widely used in glass conservation as a glue, the most often applied types are Araldite 2020 and Hxtal NYL-1 TM.

The tests were started with in-situ sampling and microscopic examinations by the author. Laboratory tests were performed on some detached tesserae in the condition of the examined alteration. The coating was applied in half of each tessera for the better comparison of the surfaces (Fig. 2). The surface character of the half-treated sample was well defined under the optical microscope (Fig. 3).

As both resins are humidity sensitive adhesives it needs to choose the most ideal cir-

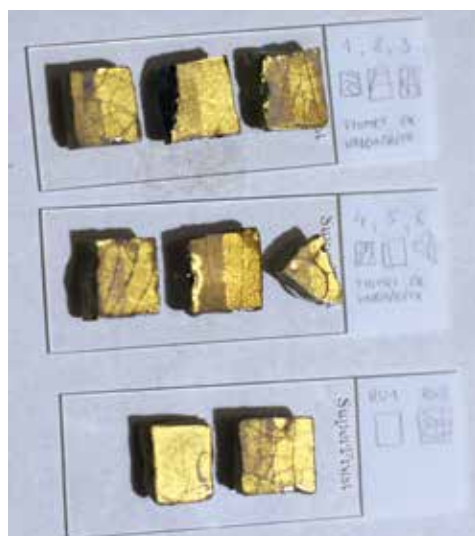


Fig. 2. Altered gold leaf tessera samples from the gold background of the mosaic after the partial application of coating on the top of the cartelline (photo by B. M. Kürtösi)

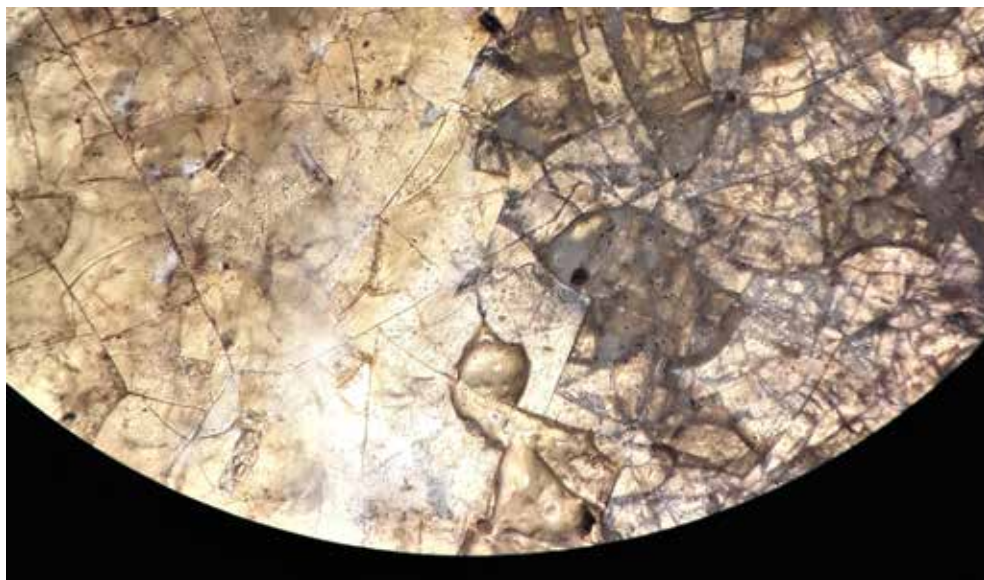


Fig. 3. Microscopic view of a half-treated gold leaf tessera. Treated part on the left, untreated part on the right (photo by B. M. Kürtösi)

cumstances for working with them on outdoor or semi-outdoor mosaics. According to Tsedenova et al (2015) up to 50% RH the two types' working properties are similar. The best results in bonding strenghts were obtained at 43% RH, while the values higher than 60% RH led to weak outcome during application and bonding. The ideal temperature for the treatment is 25 °C (Sideriou et al 2016, 288.). It is important to note that these properties strongly determine the ideal time and period of work with the resins which is not in all cases possible to realize or provide on the spot.

After the laboratory tests the in-situ trials were performed. Also, it worth to consider that the general requirement of a treatment is the reversibility. By this kind of procedure may called to prolong the in-situ presence of these fractured tesserae, thus the compatibility can be considered as one of the more important factors.

RESULTS

By the comparison of the general state tesserae with the altered samples could be detected that the supporting glass and the gold leaf are chemically the same, the difference was found in the composition of the cartelline. The Calcium content of the altered cartellina was extremely higher than that of the general state cartellina sample. Differences were detected in the Sodium and the Potassium content and their ratio as well. The data were obtained by handheld-XRF and SEM-EDX analyses performed by István Sajó, PTE-SZKK, but further investigation is needed.

CONCLUSION

For the laboratory tests and for the in-situ trials the Hxtal NYL-1™ two-component, low viscosity epoxy-resin was chosen, as UV-resistant type of adhesives



Fig. 4. Three of the altered tesserae treated on the spot (2019) (photo by B. M. Kürtösi)

suitable for outdoor purposes (Sideriou et al. 2016, 279). Its properties are compatible with those of the glass, such as exceptional non-yellowing nature combined by high strength characteristics.

Not only as a glue as it is in use mainly in the glass and ceramic conservation practice, but as a coating it may be a solution according to the actual results of the ongoing research. The on-site testing (Fig. 4) executed parallelly with the conservation works stopped in 2019 and waiting for the continuation.

TECHNICAL NOTES

Hxtal NYL-1™: <https://www.hxtal.com/> (29. 12. 2022.)

Araldite2020:

[https://www.farnell.com/datasheets/1640467.pdf?_ga=2.73488404.723075601.1565261557-238420828.1565261557](https://www.farnell.com/datasheets/1640467/pdf?_ga=2.73488404.723075601.1565261557-238420828.1565261557) (29.12.2022)

REFERENCES

Kürtösi, B. M. 2018. Research report: Kutatási dokumentáció és restaurálási terv a Fiumei úti Sírkert északi Árkádsor keleti kupola mozaikdíszeihez.

Sideridou, I. D., Vouvoudi, E. C., Papadopoulos G. D. 2016. "Epoxy polymer Hxtal NYL-1™ used in restoration and conservation: Irradiation with short and long wavelengths and study of photo-oxidation by FT-IR spectroscopy". *Journal of Cultural Heritage* 18, 279-289.

Tsenedova, J., Storne, P., Caen, J. 2015. *Influences of the relative humidity on the strenghts of glass bonds executed with Araldite 2020 and Hxtal Nyl-1*. Renovatum anno 2018

AUTHOR

Brigitta Maria Kürtösi is a painting-conservator, assistant professor at the Hungarian University of Fine Arts. Her teaching field is connected to her private practice and research interest, focusing on mosaics, dealing with mural conservation problems, historical and modern techniques and materials. She also works in the international PhD program of Pázmány Péter Catholic University with archaeology students on mosaic-related topics.