

Glazed tiles of ancient Islamic monuments along the Silk Route: Composition and restoration possibilities using ORMOCER®-like substitution material

Dipl. Min. Verena Gradmann

Dr. Paul Bellendorf (Fraunhofer-Institute ISC Würzburg, Conservation Sciences Team, Bronnbach)

Prof. Dr. Ulrich Schüßler

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Summary

From the ancient Islamic World, many noteworthy buildings like mosques and medreses are still preserved, but most of them are in need of being carefully conserved. In order to determine the composition of glazes decorating the inner and outer ceramic tiles of this cultural heritage, previous analyses were done by Mason et al. (2001, *Archaeometry*, 43, 191-209) and al-Saad et al. (2002, *J. Archaeol. Sci.*, 29, 803-810). The database can now be enhanced with new data from Central Asian Islamic buildings. The distribution of the analysed objects allows estimations about the scope of the influence of the Near Eastern cultures and the cultural imprint of the historical Silk Road, respectively.

After preliminary analyses using EDS, the samples are now being analysed with mobile XRF. The comparison of the data from XRF and EPMA shows, that the results from the mobile XRF are less precise. However, with careful calibration on the basis of EPMA-data, mobile XRF can be an important tool for on-site analysis of large quantities of glazed tiles.

The analysis data of the glazes give the opportunity to develop an adapted conservation material, which is chemically similar to the original substrate. It thus presents an art-historically reasonable solution for conservation concepts. The basis of the material is the hybrid-polymer ORMOCER®, which was developed by the Fraunhofer-Institute for Silicate Research, and which was already successfully used in different conservation projects, e.g. for glasses and metals as well as glazed tiles. Due to the variable composition of this material, a broad variety of physical properties can be considered, e.g. bonding to substrate, viscosity or surface tension.

In order to imitate the historical glazes, the ORMOCER® will be modified with coloured glass, produced according to the chemical analysis of the historical ones. The material is tested in chemical and optical characterisation (EPMA, UV-Vis-spectrometry, refractometry) and in the application on ceramics, weathered in special furnaces. Iterations of characterisation and stress simulations yield a practicable and historically reasonable conservation material. In a long-term experiment, the material should be applied in the original conditions on the original historical buildings.

Publications

Badr, J., Drewello, R., Huck--Stiasny, C., Schüssler, U. (2010): Materialwissenschaftliche Untersuchung des Fliesendekors an der Moschee Khoja Zainuddin in Buchara (Usbekistan). - *Archäometrie und Denkmalpflege - Kurzberichte 2010*, in: Hahn, O., Hauptmann, A., Modarressi-Tehrani, D., Prange, M. (Eds.): *Metalla*, Sonderheft 3: 172-174.