

Floors in ancient Greek luxury villa were laid with recycled glass

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Excavation and mosaic floors of villa. Credit: University of Southern Denmark

Although this 1700 years old luxury villa was excavated and examined both in 1856 and in the 1990s, it still has secrets to reveal.

New secrets have now been revealed by an international research team, with Professor and expert in archaeometry, Kaare Lund Rasmussen from University of Southern Denmark leading the so called archaeometric analyses: using chemical analysis to determine which elements an object was made of, how it has been processed, etc.

Others in the team are Thomas Delbey from Cranfield University in England and the classical archaeologists Birte Poulsen and Poul Pedersen from Aarhus University and University of Southern Denmark. The team's work is published in the journal *Heritage Science*, including archaeometric analysis of 19, approximately, 1600 years old mosaic tesserae.

One of seven wonders of the world

The tesserae originate from an excavation of a villa from late antiquity, located in Halikarnassos (today Bodrum in Anatolia, Turkey).

Halikarnassos was famous for King Mausolus' giant and lavish tomb, which was considered one of the seven wonders of the world.

The villa was laid out around two courtyards and the many rooms were adorned with mosaic floors. In addition to [geometric patterns](#), there were also motifs of various mythological figures and scenes taken from Greek mythology; e.g. Princess Europa being abducted by the god Zeus in the

form of a bull and Aphrodite at sea in her seashell.



Selection of the mosaic tesserae, investigated by professor Kaare Lund Rasmussen/ University of Southern Denmark. Credit: Kaare Lund Rasmussen/University of Southern Denmark

Motifs from the stories of the much younger Roman author Virgil are also represented.

Inscriptions in the floor have revealed that the owner was named Charidemos and that the villa was built in the mid-fifth century.

A costly luxury

Mosaic flooring was a costly luxury: expensive [raw materials](#) like white, green, black, and other colors of marble had to be transported from distant quarries. Other stone materials, ceramics and glasses also had to be imported.

"I received 19 mosaic tesserae for analysis in my lab in Denmark. Of these, seven were of glass in different colors; purple, yellow, red, and deep red. My conclusion is that six of them are probably made of recycled glass," says Kaare Lund Rasmussen.

This conclusion is based on a [chemical analysis](#) called inductively coupled plasma mass spectrometry. With it, the research team has determined the concentrations of no less than 27 elements, some of them all the way down to a concentration of billionths of a gram.



Detail of mosaic floor. Credit: Kaare Lund Rasmussen/University of Southern Denmark.

Waning of Roman Empire—We were able to distinguish between base glass from Egypt and base glass from the Middle East and also, we could determine which elements were added by the ancient craftsmen to color the glasses and to make them opaque, which was preferred at the time, he says.

It is of course difficult to extrapolate from only seven glass mosaic

tesserae, but the new results fit very well with the picture of Anatolia in late antiquity. As the power of the Roman Empire waned, [trade routes](#) were closed or rerouted, which probably led to a shortage of goods in many places—including raw materials for [glass](#) production in Anatolia.

This, together with the stories depicted on the floors, allows the classical archaeologists to put together a more detailed picture of what was fashionable in late antiquity and what the possibilities were for the artistic unfolding.

More information: Kaare Lund Rasmussen et al, Materials and technology of mosaics from the House of Charidemos at Halikarnassos (Bodrum, Turkey), *Heritage Science* (2022). [DOI: 10.1186/s40494-022-00697-3](#)

Provided by University of Southern Denmark

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