

X-ray microtomography: a non-destructive tool to visualise different links in the production chain of ancient pottery

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Pottery-making can be considered as a complex activity combining technical and social constraints. To facilitate subsequent interpretations, e.g., concerning organisational aspects of pottery production such as craft specialisation, or implications of provenance studies for regional trade and interaction, a thorough reconstruction of the production technology as well as scientific investigation of the desired use of the ceramic products (e.g., storage vs. cooking pots) is essential. In this respect, geochemical, petrographic and spectroscopic techniques have proven to contribute substantially to our understanding of the technological aspects such as raw materials, manufacturing techniques and vessel function (e.g., see Tite et al., 2001). However, these investigations are most often accompanied by a destructive preparation of the samples.

Here, we want to present high-resolution X-ray microtomography (μ -CT), which is a non-destructive and non-invasive method, as a valuable research tool in the study of pottery from prehistoric and Alamannic origin. By means of computer aided image processing, μ -CT inspection combines qualitative and quantitative analysis of metric and shape properties of the fabric components in the pottery (Kahl & Ramminger, 2012).

The microstructure of selected prehistoric (excavation site of Hamburg Boberg, northern Germany) as well as Alamannic (Groß-Gerau, near Frankfurt, Germany) potsherd samples has been investigated by μ -CT. The samples show distinct differences in morphology and orientation of the pore structure, that can be used to infer the actual coiling technique (e.g., Lindahl & Pikirayi, 2010) that was applied in the forming process of the vessels. Moreover, our μ -CT analyses of the early Alamannic sherds (4th century AD) are the first microtomographic studies on building techniques of ceramic vessels used for cooking from the Rhine-Main-Neckar River-Area (the former Limes region, south-western Germany). Furthermore, X-ray microtomography can be used to infer the nature of organic temper even with all plant remains completely burnt out during the firing process. In addition, the μ -CT method could be utilised to ensure the homogeneity of samples envisaged for geochemical analyses, especially with respect to the distribution of chemically diverse fabric compounds. As underscored by our investigations, the non-destructive μ -CT method is a valuable research tool in the investigation of hand-made pottery.

References

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