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## Chemical Analysis with Neutrons for Cultural Heritage Research

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Elemental analysis based on neutron activation provides a number of advantages for the study of ancient objects. It is non-destructive, the sample preparation is simple, and most elements can be analyzed with low detection limits. The most commonly used methods are prompt gamma activation analysis (PGAA) and instrumental neutron activation analysis (INAA), which enable a panoramic bulk analysis. Since PGAA and INAA are complementary for some elements, a combination of both methods is possible to further increase the number of detectable elements.

One of the main tasks in archaeology is provenance analysis. Multivariate statistics can be applied to chemical fingerprints, which can be used to find out the origin of ancient building materials, everyday objects or works of art. This makes it possible to reconstruct old transport and trade routes. Activation analysis can also be used to solve conservation and restoration issues, e.g. to find out which treatment methods can minimize corrosion. Another PGAA-related method used in cultural heritage research is prompt gamma-ray activation imaging combined with neutron tomography (PGAI-NT), which provides spatial resolution of the elemental composition. This technique can be used to “look inside” objects non-destructively to reveal ancient manufacturing processes or their previous usage. We will provide an overview of the methods and their applications at the MLZ.

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