

APPLICATION OF PORTABLE (HANDHELD) NITON XRF ANALYSER IN SOME ARCHAEOLOGY PROJECTS

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Introduction

Our research group has recently invested in a portable and handheld XRF instrument (NITON XL3t 900) as a part of a long term tender in field of archaeometry. This technique is a very novel one in this field of interest in our country and there is a great demand for it. First of all we plan to map the possibilities of this portable instrument, studying the effect of parameters on quantifying such as sample type (metal, alloy, ceramic, glass), sample geometry (especially the surface curvature), matrix effects. During this studies we have measured reference materials (soil and rock), then many artefacts such as terra sigillata samples, ancient alloys (gepida clasps, roman fibules, coins) and some type of glazes. Comparison will be made between our results and that of measured conventionally (non portable XRF).

Experimental

The portable XRF analyser is an energy dispersive NITON XL3t 900 model from Thermo Scientific, equipped with an 50 kV x-ray tube (Ag anode) and a Si PIN detector [1]. Measuring spot size is about 10 mm. According to the sample type data acquisition time (measuring time) is 30-120 secundum. Light elements (Mg, Al, Si, P, S, Cl, K, Ca, Ti) can also be measured with help of He-purging system which is easily attachable to the instrument. Gepida and roman artefacts was provided by Xantus János Museum of Győr, terra sigillata samples and certificated reference materials (NCS DC and GBW:soil and rock) were from Institute for Geochemical Research Hungary.

Results

Although we are at the beginning of applying this XRF analyser, many excellent features can be seen even now. Most advantage one is that there is no need of sampling and destruction of the given sample

and reliable qualitative and quantitative data can be given in rapid measurements. Best results are in case of samples with even, non bended surface where the gap is minimal between the sample and the detector and they are perpendicular to each other. Data obtained from measuring of standard material by XRF are in good accordance with certified values. In case of terra sigillata artefacts with strongly bended surface there are some great deviations in data obtained by conventional and portable XRF method so this geometrical problem must be solved. In case of measuring ancient (3-5. century A.C.) gepida alloys from different burial places and tombs from Hungary it turned out not to be made of bronze as it is believed by today but a kind of brass. There was no any trace of tin but more than 10 percent zinc besides copper in all cases. These results can force to revise some theories about alloy making in a given historical period.

Conclusion

Portable NITON XRF analyser can be used very efficiently especially with portable He-purging system (for measuring so called light elements) for measuring archeological samples of many kind (alloys, ceramics, glasses, glazes). The instrument (ca. 1,5 kg) can be carried easily to anywhere so there are great possibilities to collect important data even from the most valued samples which are not transportable.

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References

1. I. Hiroyuki, K. Jun. *Forensic Sci. Int.* 151, 267 (2005)