

## **Determination of the elemental composition of archaeological ceramics found on the territory of Kazakhstan, by nuclear-physical methods and statistical analysis of the results.**

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The Neutron Activation Analysis (NAA) Group at the IREN research facility, Frank laboratory of neutron physics (FLNP) JINR do determination of the elemental composition of samples of different origin. Several methods are used for experiments, including neutron activation and X-ray fluorescence (XRF) analysis. Investigation of the elemental composition of 17 ceramics pieces found on the territory of Kazakhstan with statistical processing of the results was carried out in cooperation with the al-Farabi Kazakh National University. The samples were irradiated using the IBR-2 reactor and the IREN facility for NAA. A pneumatic transport system at the IREN facility was used to determine short-lived isotopes, while the IBR-2 reactor – medium- and long-lived isotopes. The spectra of the induced activity were measured by the HPGe detector Canberra GC4018 with a relative efficiency of 40%. The spectra were processed using the Genie-2000 software. The calculation of the detected elements mass fraction was done using the “Mass fractions” software. A Bruker S6 JAGUAR wave dispersive spectrometer was applied for XRF. The standardless SMART-QUANT WD method of analysis was used for measurements, the spectra were processed in the SPECTRA-ELEMENTS software. 38 elements were found using NAA, and 14 –using XRF. Statistical analysis of the data was done using the R software. Assumptions were made about the places of origin of the ceramics as a result of the experiment.

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