



THE STUDY OF METAL ARTIFACTS OF SLAVIC POPULATIONS IN THE TERRITORY OF THE MOSCOW REGION BY NEUTRON TOMOGRAPHY AND DIFFRACTION METHODS

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INTRODUCTION

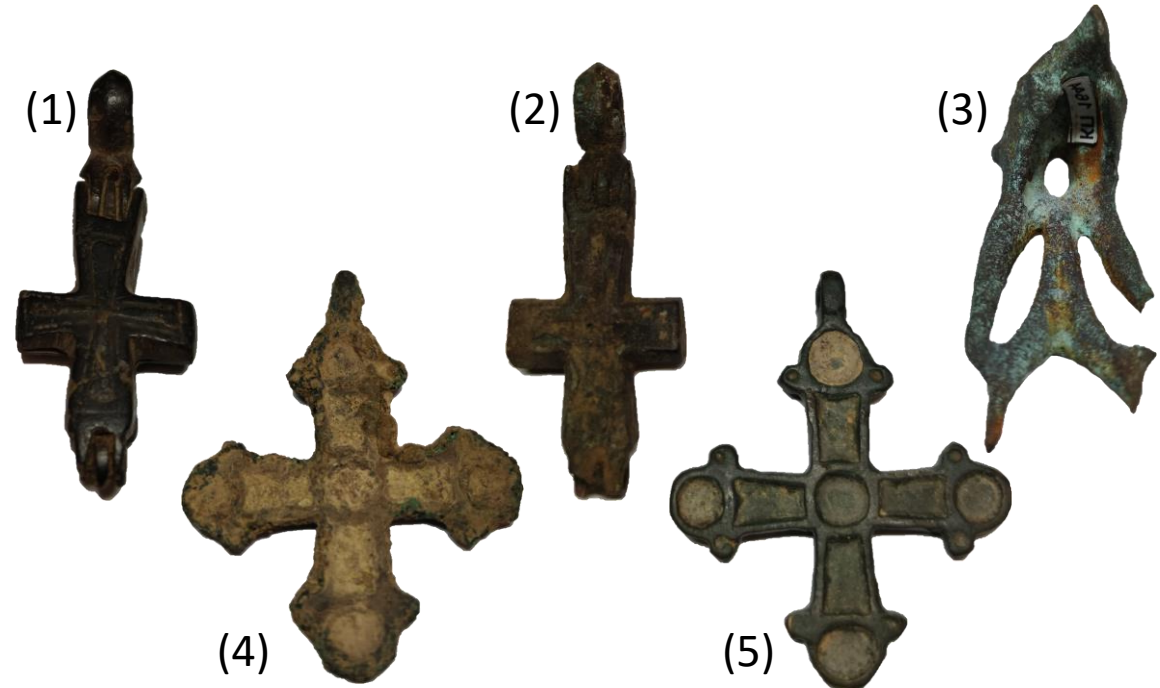
Recently, interest in the study of archaeological finds by methods of non-destructive structural diagnostics has increased significantly in archaeological research. Among them are the methods of **neutron radiography and tomography**.

These methods provide an exceptionally careful attitude to the unique archaeological materials under study and allow obtaining new unique information about:

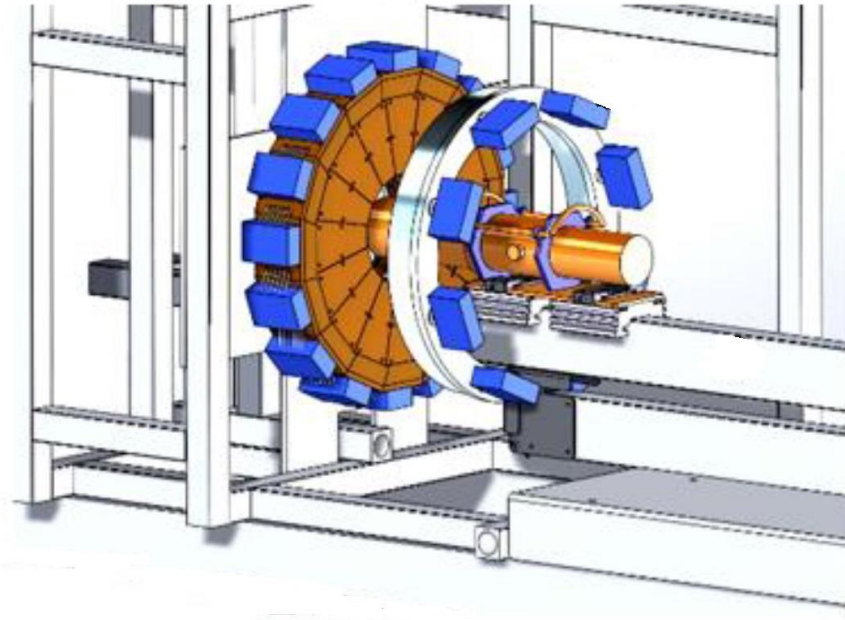
- the phase and elemental composition of archaeological objects;
- about hidden components or interior decoration of ancient products;
- about individual features of ancient production technologies.

SAMPLES

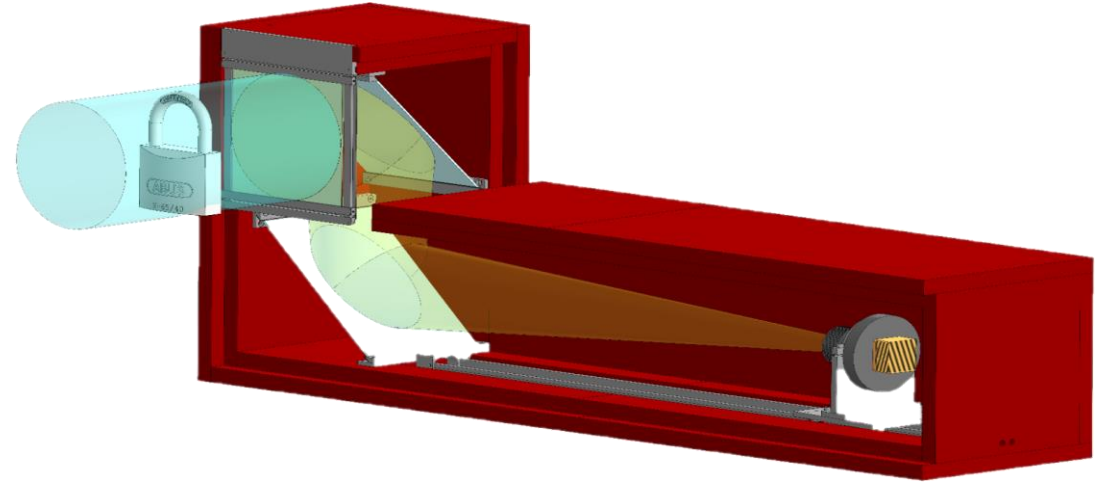
A number of finds were obtained, some of them were transferred for research using non-destructive methods at **FLNP JINR**. The finds included **two encolpion crosses (1,2)**, **two underwear pectoral crosses (4,5)** and a **pommel of a dagger or wand, in the shape of a bear's head and skin (3)**.



METHODS



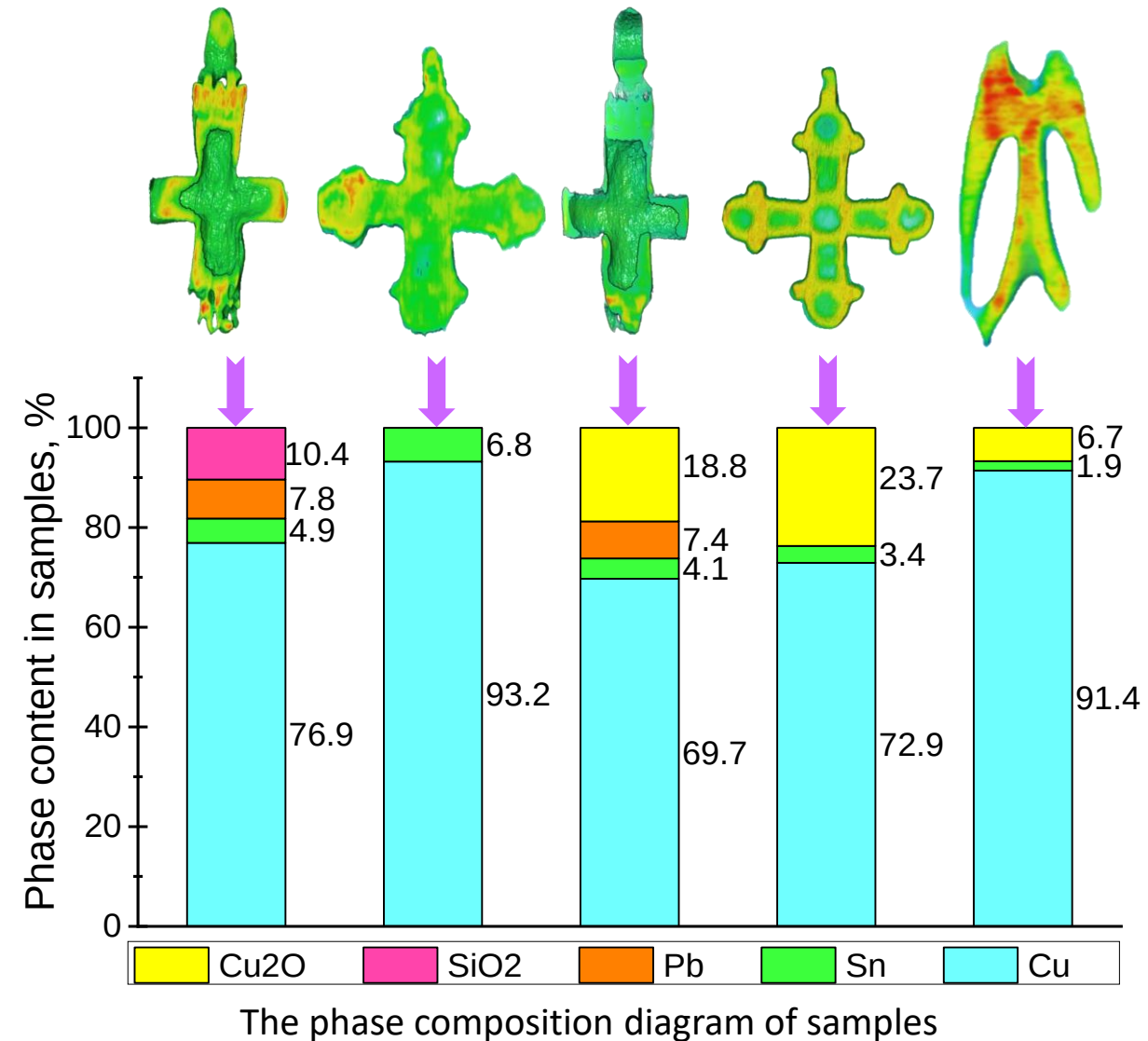
To study the phase composition, the neutron diffraction method was used, which was carried out on a specialized **DN-12 diffractometer** at the **IBR-2 reactor**.



The spatial distribution of phases and components within the volume of the product was restored using the method of neutron radiography and tomography at a **specialized experimental station on the 14th channel of the IBR-2 pulsed reactor**.

CONCLUSIONS

- ❑ Neutron tomography shows **uneven phase distribution** in the samples. In encolpion crosses, such unevenness is associated with the spread of **corrosion in the connecting parts of the sample**. It can also be seen that corrosion penetrates deep enough into the thickness of the bear-shaped figurine. Unfortunately, **the contents of the encolpion crosses have not survived**.
- ❑ The technology of making all the samples is casting. All samples are composed of **tin bronze** with a **tin** content of 1.9% to 6.8%, which indicates the artificial addition of tin to the alloy. In pectoral crosses, **lead** is also present as an additive at a concentration of 7.4 - 7.8%. Corrosion on all samples consists of **Cu₂O**. One sample contains **quartzite**.



THANK YOU FOR YOUR ATTENTION!