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The study of the objects of cultural heritage of the ancient Turkic cult-memorial complex using neutron tomography.

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Archaeological objects, objects of cultural heritage have a special value due to their uniqueness, antiquity and existence in a single copy, therefore, the most justified is the use of modern methods of non-destructive testing for their research. One of such methods of non-destructive testing, which gives sufficiently complete information about the surface and internal structure of the objects under study, are the methods of neutron radiography and tomography. The nature of the interaction of neutrons with matter determines the high penetrating power of these methods and sensitivity to hydrogen-containing phases or components of the object under study. Differences in the total neutron absorption cross-section for different elements make it possible to visualize the distribution of inhomogeneities of composition or structure in the studied objects and materials, to obtain their three-dimensional (3D) model. This paper reports on the results of the study of metal objects of cultural heritage (weapons and household items) found in the cult-memorial complex of Eleke Sazy. The complex is located in Tarbagatay district of East Kazakhstan region. The cult-memorial complex of Eleke Sazy appeared on the site of the burning of the body of one of the khagans of the Western Turkic Khaganate. The appearance of the complex in these regions reflects the cultural processes in the center of Asia associated with the entry into the historical arena of the ancient Turks, their spiritual, ideological, religious and philosophical orientations. The features and spatial distribution of phases and the internal structure of metal objects were studied by neutron radiography and tomography at the experimental station TITAN on the 1st channel of the stationary research reactor WWR-K (Institute of Nuclear Physics, Almaty). Using neutron tomography, three-dimensional data on the spatial distribution of the chemical elements of the samples under study, as well as the features of the casting process, were obtained. Based on the results of these studies, corrosion occurring on the surface of copper or bronze finds was determined, which is important for the development of the methodology of restoration and preservation of valuable archaeological objects.

Summary

Presenter: ZHOMARTOVA, Ayazhan (Joint Institute for Nuclear Research)

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