

NEUTRON TOMOGRAPHY AND DIFFRACTION IN THE STUDY OF THE CULTURAL HERITAGE OF ANTIQUITY AND THE MIDDLE AGES

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The study of cultural heritage by state-of-the-art scientific methods is an important interdisciplinary field. Of interest are archaeological finds made of metal [1, 2]. Such artifacts store valuable information about the technological, economic and social level of ancient states. Corrosion processes occurring in metals also require careful study, because it improves restoration and conservation methodologies. However, research methods traditional in archeology are often unacceptable due to their destructive nature or give incorrect information due to the small depth of penetration. In such cases, neutron tomography and diffraction can be used [3].

In this work, metal artifacts of various ancient states located on the territory of modern Russia (Krasnodar Krai, Republic of Tatarstan, etc.) were studied. Research was carried out at the facilities of the IBR-2 high-flux pulsed reactor: neutron radiography and tomography (NRT), DN-6 and DN-12 diffractometers. Using neutron tomography, spatial variations in the phase composition were visualized, the degree of degradation and the spread of corrosion were determined, and the original appearance of some artifacts was reconstructed. The phase composition was measured by neutron diffraction and Raman spectroscopy. The data obtained made it possible to shed light on aspects of the craft, to identify archaeological objects.

In addition, we have encountered a number of problems, the solution of which requires the use of new algorithms for tomographic reconstruction. This is an improvement in the quality of the resulting models, a decrease in the time spent on routine actions, and a decrease in the time for the experiment. Therefore, modern approaches have been proposed and applied.

1. Bakirov, B.A., Kichanov, S.E., Khranchenkova, R.K. et al. J. Synch. Investig. 14, (2020).
2. Bakirov B., Saprykina I., Kichanov S. et al. J. Imaging. 7, 129 (2021).
3. Podurets, K.M., Kichanov, S.E., Glazkov, V.P. et al. Crystallogr. Rep. 66, (2021).

The speaker is a student or young scientist

Yes

Section

1. Synchrotron and neutron radiation sources and their use in scientific and applied fields

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