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The neutron imaging study of cultural heritage items from Tver treasure

One of the most important tasks of archeology and other human sciences is comprehensive study of the cultural heritage items, which takes us into the deep past and allows understanding the formation and development of civilizations and ethnic groups. The special value and uniqueness of such items requires application of advanced nondestructive methods for their studies [1.2]. One of such methods is neutron radiography and tomography, which gives detailed information about the internal structure of the investigated objects. The difference in the total absorption cross sections of neutrons for different elements allows visualizing the distributions composition or structural heterogeneities in the studied materials, obtaining a three-dimensional model spatial resolution of a portion of a millimeter [3].

In this paper, the results of the studies of cultural heritage items found in Tver treasure are discussed [4]: fragment of two-leaved bracelet and the pendant. In order to obtain information about the internal structure of those cultural heritage items, neutron tomography experiments have been performed. These studies were prepared at the neutron radiography and tomography facility on beamline 14 of the IBR-2 the high-flux pulsed reactor [5].

According to the observed neutron tomography data, the 3-D analysis of radial pendant revealed that the thick ring with edges bent outside was used as a main fastening element; the studied fragment of the two-leaved bracelet was made in the technique and style of the first Kiev workshop which elevates the Tver treasure to the rank of other unique and composition rich treasures dating of the pre-Mongol period.

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