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FEATURES OF THE STRUCTURE OF FERROUS METALLURGY OBJECTS OF THE MEDIEVAL GOLDEN HORDE ACCORDING TO NEUTRON TOMOGRAPHY DATA

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In our work, we tried to identify the structural features of fragments from cast iron cauldrons of the medieval Golden Horde, as a representative of the products from the ancient iron casting process. We have selected two groups of iron-cast fragments from the Selitrennoye settlement in the lower parts of the Volga River and the Bolgar settlement in the central Volga region. Both settlements were capitals of the Golden Horde during the 13–15th centuries AD, but the difference in geographic location and historical area appoints them as manufacto-ry centers with modified technological approaches for casting and processing cast iron within the borders of one ancient state in a similar historical period. We expect a difference in the structural features of the internal structure of the fragments from cast iron cauldrons.

For this purpose, the method of neutron tomography was used, which is sensitive to light elements, has a noticeable difference in contrast between isotopes and a high penetrating effect through metals or heavy elements. An analysis of three-dimensional neutron tomography data to obtain the size distribution, some morphological characteristics, and the orientation of internal pores in cast iron fragments can provide not only qualitative, but also quantitative markers of the structure of cast iron products. We suggest that the versatility of gas-shrinkage porosity processes in the processing of cast iron in ancient workshops can serve as structural markers for identifying the location of iron producers, the presence of additional forging of cast iron products, as well as the features and primary composition of casting molds.

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