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The systematic structural studies of some Byzantine ceramic fragments using neutron diffraction, tomography and Raman spectroscopy.

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The systematic studies of composition and spatial distribution of main phases inside volume of twenty-five fragments of Byzantine ceramic obtained in archeological works in the Dobrudja region, Romania, have been performed using neutron diffraction and tomography, and Raman spectroscopy. To determine the mineral phase composition of the studied ceramics, we used the neutron diffraction method using a DN-6 neutron diffractometer [1] of the IBR-2 pulsed reactor (JINR, Dubna, Russia). The features and spatial distribution of phases were studied by neutron radiography and tomography [2] at a specialized experimental station NRT on the 14th channel of the IBR-2 high-flux pulsed reactor. The obtained data on the mineral composition of the studied ceramic materials indicate the production of dishes, mainly from clay with a natural admixture of feldspars, quartz, calcite and mica. We assume that the presence of calcites, including aragonite, may be associated with shell particles present in the sand from the seashore. Therefore, we associate larger grains or formations within the volume with a source of sand on the coast. Based on the content of mineral phases of quartz and mica, three groups were distinguished: samples with a low calcite content - up to 15% and with a high calcite content - from 40 to 90%, and the 3rd group with a mica and quartz content of less than 30%. Comparison with neutron tomography data for these groups yielded very interesting data and assumptions. We assume that ceramic samples from group 2 have an imported nature of these ceramic products. In conclusion, we believe that not only the phase composition of ceramic fragments can indicate the source of raw materials, but also some structural features observed by neutron tomography can provide the necessary structural markers for assumptions about the pottery manufacture location or chemical processes occurring during annealing.

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Summary

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