



Petrographic and porosimetric study of opuka stones from different construction phases of the medieval Church of the Beheading of St. John the Baptist in Dolní Chabry (Prague, Czech Republic)

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Opuka as a very fine-grained sedimentary rock deposited during Upper Cretaceous in relatively shallow (hemipelagic) marine conditions in the Bohemian Cretaceous Basin (Czech Republic) represents type of natural stone that has been widely exploited and used for construction from about 9th c. AD. Romanesque churches in Prague and central Bohemia are among the first preserved structures for which the opuka has been used. Question whether very local or more distant sources have been employed represents still unsolved matter.

In the recent study, we focus on the detailed analysis of specimens of opuka taken from the Church of the Beheading of St. John the Baptist in Dolní Chabry (Prague). During the previous archaeological survey of the recent church (dated to 12th c. AD), remnants (basements constructed of opuka stone) of three older churches have recognized. The aim of recent material study is recognition of similarities or differences between opuka stones coming from these different construction phases and answering a question, whether material from a single source or from different localities has been employed.

The study is based on the detailed petrographic examination using four sets of techniques: (1) microscopic observation (basic optical microscopy supplemented with the electron microscopy with microanalysis and X-ray elemental mapping), (2) X-ray diffraction of insoluble residue (composition of clay fraction and detection of some less organized silica forms), (3) chemical analysis and computation of modal composition by using normative minerals based on known mineralogical composition (input from microscopy and XRD), (4) study of physical properties, specifically by means of mercury porosimetry to quantify complex pore space of these rocks.

Based on the results, three basic sets of specimens have been distinguished: (1) opuka stone with low content of carbonates (22-26 wt. %) and with higher content of kaolinite and illite (both WCI and PCI), (2) opuka stone with intermediate content of carbonates (28-43 wt. %) with very low to negligible content of illite/muscovite and kaolinite but with significant presence of smectites, and (3) opuka stone with high content of carbonates (62-73 wt. %) and clay mineral characteristics as the first group. The respective groups of opuka stones differ also in their microstructural and pore space characteristics.