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Mineralogical characterization of rendering mortars from decorative details of a baroque building in Koźuchów (SW Poland)

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ABSTRACT

Optical microscopic observations, scanning electron microscopy and microprobe with energy dispersive X-ray analysis, X-ray diffraction and differential thermal/thermogravimetric analysis allowed detailed characterization of rendering mortars from decorative details (figures of Saints) of a baroque building in Koźuchów (Lubuskie Voivodship, Western Poland). Two separate coats of rendering mortars have been distinguished, differing in composition of their filler. The under coat mortar has filler composed of coarse-grained siliceous sand, whereas the finishing one has much finer grained filler, dominated by a mixture of charcoal and Fe-smelting slag, with minor amounts of quartz grains. Both mortars have air-hardening binder composed of gypsum and micritic calcite, exhibiting microcrystalline structure.

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1. Introduction

Mortars employed in ancient constructions comprise various binding materials of aerial or hydraulic nature, natural or artificial aggregates, as well as numerous additives, passive or latent hydraulic — which react with binding material [1]. Lime was continuously used in building work as basic binding material, before cement was discovered [2], whereas mixed gypsum lime was employed less frequently. Whatever the composition of the binder, historic masonry commonly exhibits deterioration, first of all caused by natural and anthropogenic weathering. The restoration of historic masonry requires knowledge enabling to reproduce materials with physico-chemical and mechanical proprieties similar to the original ones. The use of recent cement-based or polymer-based repair materials may

induce damages to original historic masonry [3–6]. Mineralogical studies of historic masonry provide information on employed raw materials and techniques applied in ancient building industry, which may help to find out most compatible materials for future restoration.

A wide spectrum of ancient masonry analyses has been published. The majority of studies concerned the masonry located within the Mediterranean Basin [4,5,7–9], as well as Western Europe [10–12]. Studies on historic masonry from Central Europe are relatively rare [13,14]. This study describes renders, taken from baroque decorative details (figures of Saints) located on the façade of a building in Koźuchów (SW Poland). The main objective is to characterize compositional parameters of studied mortars and to shed light on technological aspects of manufacturing process.

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2. Historical Notes

Kożuchów is a small town located in the Western part of Poland and is situated about 21 km southwards the Zielona Góra — capital city of Lubuskie Voivodship (Fig. 1). Its history in written record dates back to 1293, when a document have been issued by Duke Henry III of Głogów, confirming the agreement between duke Konrad I and Tomasz, Bishop of Wrocław. In these early times Kożuchów was already a fully developed settlement, which underwent a considerable urban development in the late Middle Ages. Subsequently, the town was growing and at the turn of 13th and 14th centuries it developed fieldstone fortifications. In 14th century, the earliest town hall was erected, together with several churches, which underwent numerous reconstructions later. Apart from monuments mentioned above, there is a congested housing in the downtown of Kożuchów, comprising numerous monumental buildings, erected from 16th to 20th century. In 2006 a renovation project has started, aiming at the restoration of compact settlement's original splendour. The building located in the Klasztorna Street no. 6 was qualified for restoration treatments among others.

Until now, no detailed characteristic of the building's original masonry was known. According to Kowalski [15], the building is baroque, and presumably was erected at the beginning of the 18th century. However, records of the Office of the Protection of the National Heritage, Department in

Zielona Góra date this building from the 17th century (Evidence Card Green: Kożuchów, Klasztorna 6, 1959). During the 19th and 20th century the building went through several restorations, concerning its plasters, stuccowork and renders. Those restorations were not aimed at bringing elements to their original form, presumably due to lack of technical data referring to original masonry. During these successive restorations, only two figures of Saints were left unchanged. They are situated between windows (Fig. 1). The figure on the northern side (left side of the façade) represents Saint Peter, whereas the one on the opposite side (right side of the façade) represents Saint Paul (Figs. 1, 2). After a period of neglect, in 1960 the inner part of the building was pulled down, except for its façade, which is intentionally preserved due to the specific nature of its architecture. Both figures were in poor condition, particularly that of Saint Peter, which lost almost 80% of its primary shape.

3. Experimental Procedure

Sampling was carried out with use of a chisel and a little hammer, with great care to maximally reduce damage to the figures. Both of them are composed of brick core (Fig. 2), covered with two layers of render: (1) the under coat creamy mortar and (2) the finishing, greyish one (Fig. 2). Four representative samples of rendering mortars ranging from 5 to 15 g in weight were collected, K1 (finishing mortar) and K2 (under coat mortar)

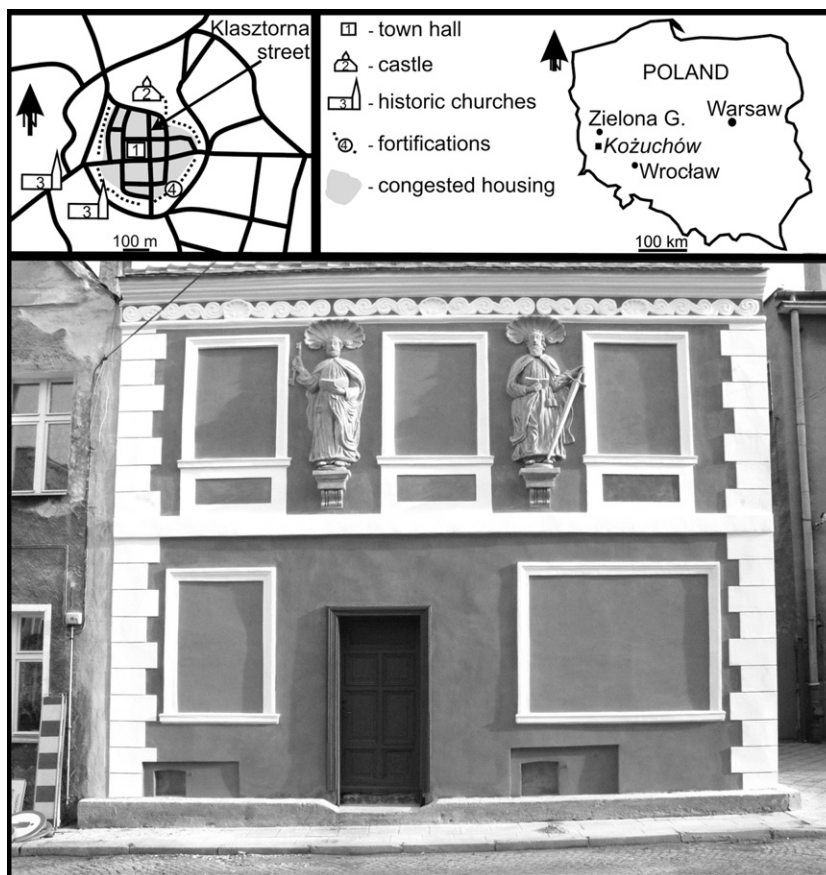


Fig. 1 – Location of Kożuchów, the Klasztorna street, and frontal view of the building after restoration.

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