



Mortar mixes with oxblood: historical background, possible recipes and properties

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In the past, many organic additives— especially proteinaceous compounds— were added to mortars to improve their workability and performances when set . Oxblood was one of the most common proteinaceous additives. According to many historic sources, it was used specifically for its hydrophobic properties, and hydraulic mortars with blood addition were frequently described as hard, adhesive and durable. Apart from improving mortar properties, its use in architecture could also be considered as a mean of slaughterhouse wastes disposal to avoid environmental contamination, especially in big cities.

The use of animal blood in mortars was mentioned in many ancient texts, from both Europe and Asia; with the emergence and development of modern Chemistry in the 18th and 19th century, historic accounts witness about recipes with more precise compositions and more specific applications of such mortars . According to these recipes, they were used mostly as glues or mastics for ceramic, vitreous, metal items, but moreover blood addition was also used in the mortars mixes . For instance, a series of lime-pozzolan mortars added with oxblood, with waterproofing quality were recorded in French treatises. Oxblood was also used to directly slake or mix the lime. Similar texts appeared in some Italian manuals for public projects and constructions, which were related to the French texts; it is worth noting that, in this case, the different objectives of the texts implied more precise compositions and indications. According to some English sources, oxblood beaten together with lime gives a great flooring and plastering material. Whole blood on the other hand, according to some Italian literatures, could be used as colorant or to protect bricks and tile surfaces

In this study, a precise recipe of lime-pozzolan mortar with blood addition from a 19th century Italian manual was chosen; specimens were prepared accordingly, with the aim to analyze them, in order to understand the chemical, mineralogical and physical characteristics of such compositions, starting from a blank reference specimen. Some problems were encountered in specimen preparation, such as the differences between the ancient materials mentioned in the historic recipe, and those available nowadays. Another issue quite unclear, was regards the use of the whole blood which contains fibrin, or only the blood serum. In some cases it was clarified, by e.g. Carbonell and Guyton de Morveau, that blood serum could be used to produce plasters lighter in color, to cover the outer surfaces of stones and walls.

In this research, specimens have been prepared with whole blood, trying to add the blood in uncoagulated form by removing fibrins after it was collected. Upon visual observation of the hardened specimens, a distinctive dark red color is shown on the top surface of the specimens with blood addition, which probably corresponds to the description of the literatures on the use of oxblood as colorants. The external surface and the internal bulk of the specimens were observed by means of Scanning Electron Microscopy, and the results gave some first indications on the microstructure and morphology of the examined specimens.