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MODIFIED MUD BRICKS FOR STRENGTHENING HISTORIC EARTHEN STRUCTURES: TOWARDS SUSTAINABLE AND GREEN RESTORATION

Abstract

The use of mud brick as an ancient building material reaches far back in the history of architecture. Mud bricks consist of clay and sand, reinforced with plant fibres such as rice husks or straw. Mud bricks in most heritage buildings made of earth have suffered significant damage due to various causes. The present research aims thus at maintaining the stability, the compatibility and the compressive strength of mud bricks without changing their historical characteristics. We verify the strengthening effectiveness and their compatibility to usage when applied on mud bricks. The experimental aspect of the research included the assessment of the physical, chemical, and mechanical properties of historical mud bricks and the identification of phenomena of internal deterioration. Furthermore, the paper proposes the use of nano- and waste- reinforced mud bricks in restorations processes of historical buildings. These have been tested using different innovative mixtures such as nano-kaolin, silica fume, and Homra (fired bricks" dust), to increase the stability and durability of these mud bricks. All proposed mixtures were tested after 28 days of samples formation. The properties of proposed mixtures for mud bricks gave satisfying and promising results for the use of nano- and waste-reinforced mud bricks in the strengthening and the reconstruction of historic earthen structures. In addition, mud bricks consisting of mud, straw, fine sifted sand, homra (fired bricks" dust) provide a sustainable and green solution to restore historic earthen structures