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Innovative Composite Materials for Strengthening Lime-based Mortars in Traditional Masonry Structures.	عنوان البحث باللغة الانجليزية
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Abstract

The need for new innovative lime-based mortar suitable for restoring and repairing historical buildings has recently become the subject of many research studies. The new mortar should, however, fulfil the following requirements: (a) to have the same physical and mechanical properties as that of the pre-existent old mortar; (b) the pore-size distribution is comparable with that of old lime-sand mortar, and finally; (c) the mortar should set rapidly in both dry and moist environment. The main goal of our study is to find an innovative lime-based mortar which is good enough to be used in the field of restoration of the ancient structures. In order to achieve this goal, two different sets of lime-based mortars tagged as S1 and S2, have been prepared. Each set consists of four different mixtures. The test or the reference set S1, consists of four different (sand : lime : gypsum : white cement: homra*) mortar compositions. If a constant amount of pozzolanic material such as fly ash (FA) is add to each mortar composition in set S1 we then get the other set S2. Each composition can be defined in terms of its constituents as (r1:r2:r3:r4:r5:r6), where these r's stand for the volume ratio of each component material (sand: lime: gypsum: cement: homra: FA). These eight mortars were tested for the compressive strength. Moreover, the physical properties such as the bulk density, the porosity ratio, and the water absorption ratio were obtained for each

mortar. The obtained results for the physical properties of these mortar compositions revealed that the mortar B0 (3:2:2:0:0:0), i.e. without fly ash, has good physical characteristics and high strengths as well. This is related to the rate of hydrate lime, carbonation kinetic, and the speed of setting mechanism for gypsum. For those mortar compositions with fly ash as an additive, it was found the mortar composition D (3:1:1:0:0.25:0.5) has very good physical and mechanical characteristics. This is attributed to the high surface energy of the fly ash, and to the large content of silicate and aluminum oxides in both the fly ash and mortar. These two effects lead to a high potential hydration reaction in the D system. Thus, it can be concluded that, the mortar system D is a good and a substantially innovative mortar which can be utilized as a restoration mortar in repairing old buildings and structures