

Synthetic zeolite pellets incorporated to air lime–metakaolin mortars: Mechanical properties

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Abstract

In this study synthetic fine and coarse zeolite pellets were chosen in the development of air lime–metakaolin mortars for repairing ancient masonry to be used in conservation and restoration of cultural heritage. Synthetic zeolite was used due to their particular water adsorption properties and act as an artificial pozzolan promoting the development of hydraulic phases.

Physical, chemical, mineralogical and microstructural tests were accomplished to characterize the materials used in mortars' preparation.

Flexural, compressive strength and dynamic modulus of elasticity tests were performed in mortars at 28, 90 and 180 days of curing. Incorporation of both fine and coarse zeolite pellets caused improvement of mechanical strength of mortars. The highest flexural strength value (~0.5 MPa) was achieved in both mortars with fine zeolites pellets at 90 days and 20 and 30 wt.% metakaolin, and coarse zeolite pellets at 180 days and 30 wt.% metakaolin as lime replacement. 1.0 MPa was the highest compressive strength value obtained at 180 days for mortars with both fine zeolite pellets and coarse zeolite pellets, with 20 and 30 wt.% of metakaolin, respectively.

Elasticity modulus ranged from 2.3 GPa to 3.9 GPa confirming the high deformation capability of these mortars.

Zeolite pellets type A is a promise synthetic material that could be successfully used in air lime–metakaolin render mortars for applications in the conservation and restoration of cultural heritage.

Keywords:

Zeolite type A, Pozzolanic effect, Conservation and restoration, Archaeological and historical buildings, Modified Chapelle test