

# PREPARING BUILDING MATERIALS BY USING SLUDGE FROM WASTEWATER TREATMENT PLANTS AND INFILTRATION WITH SUPERCRITICAL CARBON DIOXIDE

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## Abstract

Infiltration with supercritical carbon dioxide is being investigated by our group for preparing silica-carbonate materials for different applications. In this work, construction bricks were prepared from sludge produced in a wastewater treatment plant. Initially, the sludge was conditioned by treating it at 573 K to remove the organic matter. The resulting ash was mixed with sand, and then lime and water were dosified according to a rule in which, for a fixed concentration of lime, an ash/sand ratio of 7/3 and a water content below 10 wt%, were obtained. Bricks were then made by pressing this material at 7.02 MPa.

An experimental study of the effect of lime content, infiltration time, and maximum pressure of infiltration on the extent of carbonation and final compressive strength of the materials was performed. Lime contents from 20 to 40 wt%, infiltration times from 20 to 90 min, and infiltration pressures from 6.9 to 15.7 MPa were considered. After infiltration, the extent of carbonation was determined by titration, and was visually observed by spraying the material with an ethanol solution of phenolphthalein. The extent of water absorption and the compressive strength of each material were also determined.

Nuclei of lime completely surrounded by carbonate were observed along the carbonation front. Extents of carbonation greater than 70% and compressive strengths greater than 8.6 MPa were observed in all experiments. According to the ASTM standards, these materials comply with the requirements for a “NW” type construction brick, which can be used in locations where temperature is always above the freezing point of water. Results for some of the materials indicate that other types of construction bricks may be produced.