Ain Shams University
Faculty of Science
Chemistry Department

UTILIZATION OF SOME NATURALLY OCCURRING EGYPTIAN MATERIALS IN LIGHTWEIGHT CONCRETES

A Thesis
Submitted for the degree of Master of Science as a partial fulfillment for requirements of the Master of Science in Chemistry

By

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M. Sc. Thesis

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﴿ وَقُلِ اعْمَلُوا

فَسَيَرَى اللَّهُ عَمَلَكُمْ

وَرَسُولُهُ وَالْمُؤْمِنُونَ ﴾

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Title of thesis: **UTILIZATION OF SOME NATURALLY OCCURRING EGYPTIAN MATERIALS IN LIGHTWEIGHT CONCRETES.**

ABSTRACT

This thesis deals with the production of lightweight concretes from bentonite and pumice aggregates. Bentonite ball pellets of different grain sizes were prepared and the green pellets were then dried for 48 h in open air to allow the water of workability to release. They were then fired in a muffle furnace at a rate of 20 °C/min for 1 h at 1150 °C. This temperature is the best temperature and yields the lowest density and higher bloatability without complete melting of the pellets. The bloatability of the investigated clay pellets was followed by the bulk density.

The replacement of pumice by bentonite on the production of lightweight concretes are carried out. The pumice and bentonitic materials were investigated for their chemical and mineralogical composition (XRF, XRD, SEM and EDX).

The physico-mechanical properties including compressive strength were investigated on concrete pastes. Also, phase composition was determined by XRD, XRF, SEM and EDX. The concrete pastes were produced from different percentages of bentonite and pumice aggregates. The concrete pastes include 50% bentonite + 50% pumice, 33.33% bentonite + 66.66% pumice and 66.66% bentonite + 33.33% pumice. The results of the compressive strength, density, bulk density and pH showed that these lightweight concretes were affected by the type, shape and the percentage of aggregates, the cement paste and the interfacial zone between cement and aggregates. Strength minerals represented by calcium silicate-hydrate (CSH) and calcium aluminate-hydrate (CAH) lead to the concrete strength.

Keywords: Bentonite, Pumice, Lightweight Concrete, Interfacial Zone, Engineering Parameters.

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