



10th International Symposium on Heating, Ventilation and Air Conditioning, ISHVAC2017, 19-22 October 2017, Jinan, China

Study on the Material Performance of Ceramsite Concrete Roof Brick

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Abstract

In order to study the feasibility of the ceramsite concrete applied in energy saving renovation of existing buildings roof, we use three kinds of different particle sizes of ceramsite, including big (diameter 15-18mm), middle(diameter is 6-9mm) and little (diameter 3-5mm) particles, river sand, and concrete, with the same ratio, to make bricks for studying the physical properties and mechanical properties. Implement research on roof insulation performance of water storage roof bricks made by ceramsite concrete in existing buildings through the experimental test of water storage bricks. The results show that the big particles provide the best anti-pressure performance, lowest thermal conductivity, and lowest dry density, thus the performance is best. Using water storage bricks made from ceramsite concrete in the energy-saving reconstruction of existing buildings roof effect is well, and the maximum temperature difference is up to 27.1 degrees compared with common roof.

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Peer-review under responsibility of the scientific committee of the 10th International Symposium on Heating, Ventilation and Air Conditioning.

Keywords: Ceramsite concrete, Compressive strength, Water storage bricks, Thermal physical properties, Thermal insulation

1. INTRODUCTION

Building energy conservation is a major strategic issue in China. Existing building energy saving transformation is an important part of build energy saving. Strengthening and improving the thermal insulation capacity of the roof is

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conductive to improving the indoor thermal environment of the top floor room, and saving energy consumption of air conditioning. At the same time, the reduction of urban evaporation results in the increasingly serious urban heat island effect and dry island effect. Urban water evaporation is conducive to ease the urban heat island effect and the dry island effect, at the same time, the water evaporation cooling can effectively improve the indoor thermal environment [1-6]. Existing building roof reconstruction is restricted by the roof structure, roof bearing, and roof usage. In addition, it requires achieving the purpose of energy saving without changing the original functions. Therefore, the research group intends to use ceramsite concrete to produce water storage bricks based on evaporative cooling and air insulation principle, used to pave on the existing building roof for energy saving. The advantages of ceramic concrete, such as small dry bulk density, high strength, low thermal conductivity, good permeability resistance, good fire resistance, etc., are mostly used in housing construction, bridges, ships and furnace foundation, etc.. However, it is necessary to further study the thermal physical properties of this kind of ceramic concrete, because it is very important to have a certain structure of roof bricks.

This paper focuses on testing the physical properties and ceramsite concrete and thermal insulation effect of water storage bricks, and the conclusion for the ceramsite concrete in roof construction of energy-saving transformation will provide theoretical basis for the application.

2. Raw Material

The lightweight aggregate concrete, with ordinary sand or ceramic sand as fine aggregate, is generally used as coarse aggregate. The main materials of this paper are: ceramic, river sand, cement and water. Cement with ordinary portland cement, river sand in medium sand, ceramic provided by SICHUAN RING TO NEW BUILDING MATERIALS CO., LTD., we selected three kinds of particle diameter as raw materials, respectively, for the big (aggregate diameter 15-18mm, middle (ceramsite diameter 6-9mm), little (ceramsite diameter 3-5mm). The ceramsite is non-circular ceramic, with broken appearance ,largest diameter, and irregular, as shown in Fig.1.



Fig. 1. Ceramsite picture.

3. Raw Material

3.1. Test Instrument

Ceramsite structure using Tungsten Filament Scanning Electron Microscope, the resolution: 0.8 at nm 15 kV; 1.6 at nm 1 kV; kV 4.0nm@0.1, electron back scatter spatial resolution of 0.1 microns, angular resolution of 0.5 degrees. Ceramsite concrete strength test by YSLJ-102 full automatic constant pressure testing machine for testing, showing the value of resolution: 0.1KN, showing value error: less than or equal to + 1%, the same type of block test 3 test piece. Thermal conductivity of ceramsite concrete using JTRG-III type building type flow meter measurement apparatus, measurement error is less than 5%. Meteorological parameters collected by mianzhou sunshine of meteorological science and Technology Co., Ltd. of pc-4 type environment monitoring system for monitoring, sensitivity is + 0.2 DEG C, every 1 min record 1 times.

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