



Science

ANALYSIS OF PROPERTIES OF CONCRETE USING SEA SHELLS CRUSHED POWDER AS ADMIXTURE

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Abstract

The tremendous increment of demand on concrete made admixture one of major component. As admixtures help in enhancement of concrete physical and chemical admixture. In this paper analysis of sea shells as chemical admixture is studied and verified the strength of concrete and temperature emitted due to chemical reaction to the normal Portland cement. As sea shells contain calcium carbonate, CaCo₃ as major composition, as calcium is one major component that helps in densifying and hardening of bones in all living things. The flexural and compressive strength has gradually increased; the transmission temperature and reduction time of exothermal reaction has reduced. Hence seashell acts as great admixture.

Keywords: Sea Shell Powder; Temperature Retardant; Admixture, and Concrete Exothermal Reaction.

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1. Introduction

Seashells are hard protective coat created by living organisms in sea, these seashells are exoskeletons of an invertebrate composed as calcium carbonate and calcium.

Shells are very often washed up onto a beach empty and clean, as the animal living inside that seashell is dead. There are more than 50,000 varieties of seashells present in nature.

Seashells are used in various ways as currency in history [1] [2], tools, horticulture, religion and spirituality [3] [4], musical instruments [5], personal adornment, crafts and art, architectural decoration etc. some seashells are excellent sources of calcium carbonates, which are used as

effective soil conditioner, certain types of shells are ground down and used in increasing the calcium content of the soil while raising the PH level.

Malacologist are those who study malacology which is study of marine mollusks, even though they collect few live animals for their study, most responsible collectors do not often over-collect or otherwise disturb ecosystems. Beach combers pick empty seashells very often, majority of seashells are offered for sale commercially.

The author has experimented by crushing the seashells into fine powder and mixed in concrete as chemical admixture, as seashells contain calcium these may help in increasing strength of concrete and also reduces the temperature emitted due to exothermal reaction in concrete. As there are very less study related to seashells this paper helps in using seashells as chemical admixtures if necessary.

2. Methodology

The seashells collected must be collected carefully with specific thickness and size. These shells must be crushed by hammering and powdered; as seashells are made of calcium it's difficult to make it into fine powder so as to use it as admixture. The powder must be fine and uniform without lumps and large pieces. The color of powder varies depending on the shells we have chosen to crush.

Target strength of concrete was determined by the equation.

Target strength= $f_{ck} = f_{ck} + 1.65(s)$ —[eq1] According to standard code IS10262-2009. The amount of shell powder was calculated from the following equation,

Volume of shell powder = (mass of chemical admixture/specific gravity of admixture *1000)

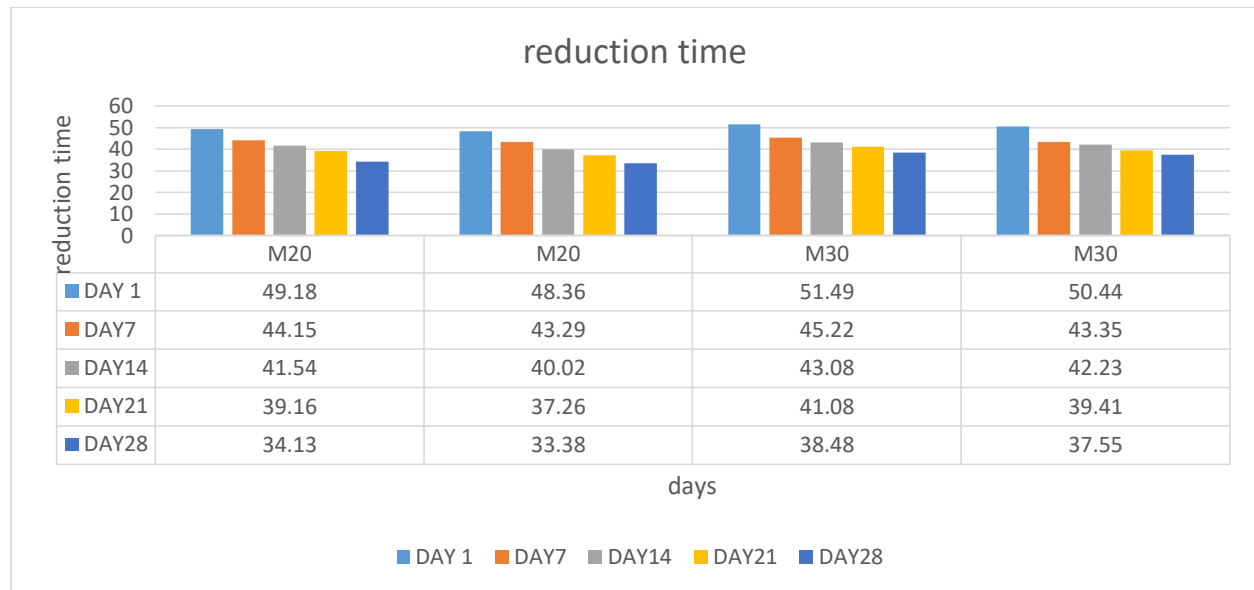
The specific gravity of shell powder was found 2.12 by Le-Chatelier principle [6] [7]. The cube casted for the size 15cm³. The compression and flexure strength were tested for 1, 3, 7, 21, 23, 28 days after casting.

An empty spaced cube with bottom, size of 10*10*10cm casted using concrete with seashell powder concrete and walls of thickness 1cm. Water of 100⁰c was filled in empty cube and the time consumed for reduction of temperature of water to 40⁰c were noted down. This gives the time consumed by cube to reduce inner temperature of 100⁰c of water to 40⁰c.

An empty cube casted by using seashell powder concrete size 10*10*10 was inserted into another larger empty cube casted using plane cement concrete size of 15*15*10cm. 3cm sufficient space was left between two cubes was filled with Water of 100c and top side of cube was closed by lid. Water temperature was noted down after 8mins for 1, 3, 7, 21, 23 and 28 days of similar casted samples. The difference between the water temperature noted after 8min and the temperature at room temperature gives the amount of heat transmitted through the walls of inner cube.

3. Results and Discussions





4. Conclusions & Recommendations

From fig(1), it can be observed that M20 & M30 grade of concrete with seashells as admixture can withstand more compressive load 20.3 and 28.24Mpa compared to normal concrete 19.71 and 27.72Mpa by 28 days. The compressive strength has increased by 3.19% and 1.84% in M20 and M30 grade of concrete respectively.

In fig(2) shows, the flexural strength obtained by concrete that is 6.43 and 8.42Mpa by seashell concrete and 5.78 and 6.43Mpa by ordinary concrete without admixture. This clearly represents the increment of 10.18% and 2.97% in flexural strength by M20 and M30 grade concrete by 28 days.

From fig(3), it can be observed that M20 and M30 grade concrete with seashell transmits minimum temperature that is 1.27⁰c & 1.23⁰c compared to the normal concrete 1.37⁰c & 1.39⁰c respectively. This state about 7.29% and 11.51% of heat transmitted property has decreased which is very effective.

From fig (4) shows time taken to bring down the temperature of sample from 100⁰c to 40⁰c. Present study reveals that seashell concrete cube takes lesser time 33min38sec & 37min55sec comparatively to the ordinary concrete without any admixture that is 34min13sec & 38min48sec. That is approximately 2.20% and 2.42% faster, hence it says although less comparative time between temperatures liberated during chemical reaction but seashell used concrete cube takes lesser time than ordinary concrete.

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