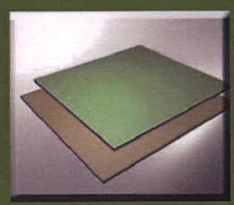
ADVANCES IN COMPOSITE MATERIALS



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Chapter 011

The Influence of Biopolymer and Natural Fiber on the Physical and Mechanical Properties of Cement Composite

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Keywords: Egg albumen; Cement; Coir fiber; Biopolymer; Matrix; Composite.

Abstract: This paper described the results of an investigation on the usage coir fiber in the cement matrix as a reinforcement to produce lightweight construction materials as well as the utilization of albumen biopolymer as a binder to enhance the performance of cement composites. The effects of fiber loading and curing time on mechanical and physical properties of the coir fiber reinforced cement-albumen composite (CFRCAC) were studied. Coir fibers with loading of 0% (control cement), 1%, 3%, 5%, 7%, 9% and 11% by weight were used as a partial replacement of cement in mixture. Flexural and compressive strength, bulk density, moisture content and water absorption were investigated. Maximum flexural strength of 6.719 MPa was achieved at 5 wt. % fiber content after cured for 35 days. Increase in fiber loading led to the reduction in density; however slightly increase the percentage of moisture content and water absorption.

Introduction

The existing concrete is low-cost to assemble, with identified disadvantages of heavy loading. Even though it is an excellent fire resistance and uniform in appearance, however, it is said to be generally brittle, weak and has high water absorption rate. Natural based materials such as fiber cement based composite (FCC) have undoubtedly emerged as the option for present civil industry needs which can be produced naturally with no adverse effects on environment and higher performance type concrete.

Coir fibers show the advantage as reinforcement because they are abundantly available, low in cost, required low processing degree and have suitable properties [1]. Coir fiber cement composites exhibited higher toughness along with inhibition of unstable crack growth and stable fracture from rapid brittle fracture of the matrix [2]. Although the physical properties of natural FCC are satisfying, the complicated mechanical properties have to be taken into account. Thus, biopolymers have been used essentially because they improve workability, mechanical properties, bond strength, flexibility, and hydrophobic properties of natural FCC.

The efforts currently are underway in producing lightweight cement based composite with the use of agriculture waste, coir fiber and biopolymer, albumen in turn to reduce the use of Portland cement which at the same time provide concrete with better properties. Hence, the