

A Study of Array Direction HDPE Fiber Reinforced Mortar

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Abstract. This paper presents the effect of array direction HDPE fiber using as the reinforced material in cement mortar. The experimental data were created reference to the efficiency of using HDPE fiber reinforced on the tensile properties of cement mortar with different high drawn ratio of HDPE fibers. The fiber with the different drawn ratio 25x (d25 with E xx), and 35x (d35 with E xx) fiber volume fraction (0%, 1.0%, 1.5%) and fiber length 20 mm. were used to compare between random direction and array direction of HDPE fibers and the stress – strain displacement relationship behavior of HDPE short fiber reinforced cement mortar were investigated. It was found that the array direction with HDPE fibers show more improved in tensile strength and toughness when reinforced in cement mortar.

1. Introduction

The last four decades have seen a large number of research studies on fiber reinforced cement materials, most of which devoted to the use of metallic (steel), synthetic (polymeric), ceramic (glass), or natural (organic) fibers. In contrast, few studies dealt with the design and development of the fibers themselves. Indeed most polymeric fibers on the market today have been conceived and introduced over thirty years ago. Addressing recent trends and future directions, Fiber Reinforced Cement Composites presents new opportunities for developing innovative and cost-effective materials and techniques in cement and concrete composites manufacturing, testing, and design.

Several types of synthetic polymer fibers such as polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), polyvinyl alcohol (PVA) have been incorporated in reinforced cement based matrices. The main problems of the polymer synthetic fiber reinforced cement are the lower tensile strength. The high density polyethylenes (HDPE), a linear chain polymer with a broad molecular weight distribution can be orient into a high strength fiber [1]. There are two processes for producing the high strength fiber including melt-spinning and gel-spinning processes [2].

In this work, the using high strength HDPE fiber prepared from the high draw ratio melt spinning technique. These method can be increase tension strength in fiber depend on the high draw ratio. The properties of ultra draw HDPE fiber are high tensile strength and high elastic modulus. In previous researches, we found that the problem of ball and grouping during the mixing the fiber with cement aggregate can reduce the strength of their composite.

The addition of fibers to cement composites influences its mechanical properties which significantly depend on the type of fiber, the percentage of fiber and fiber orientation. For development of a new type of fiber using in cement composites, ultra draw HDPE fiber can improve more mechanical properties of the fiber reinforced matrix. High tensile strength of HDPE can transfer force and disperse stress through area of the matrix.

This research has the objective to study the effect array direction of HDPE fiber reinforced in cement mortar and investigate the efficiency of the orientation HDPE fiber reinforced cement mortar.

