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MICROSCOPIC AND MECHANICAL ANALYSIS OF LATHE WASTE STEEL FIBERS AS FIBER REINFORCEMENT IN CONCRETE

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Abstract

Concrete is a material which is weak in tension and fails in brittle manner when subjected to tension and flexure. When steel scrap is added to concrete, the behavior of composite material is superior to plane concrete. In this paper an experimental investigation was carried out to study the feasibility of using steel scrap obtained from lathe machine in concrete by checking the compressive strength, splitting tensile strength and flexural strength of concrete. Properties at fresh and hardened were found out by varying proportions of lathe machine waste such as 0%, 0.5%, 1 %, 1.5% and 2% by weight of cement. All the tests were conducted on the basis of the guidelines set by ASTM standards. It was observed that the workability of the mixtures decreased with an increase in the percentage of lathe waste as fiber reinforcement, i.e. higher lathe waste, so little workability. Compressive, flexure and split tensile strength increases as the waste fiber content increases to a certain extent and then decreases as the fiber content increases further. 1.5 % of the waste fiber content is the optimum resistance content. The experimental results were verified by the images provided by SEM. It is recommended that for strength enhancement, the lathe waste can be used as steel fiber reinforcement up to 1.5% (by weight of cement).

Introduction

Plain concrete slabs are known to have low strength and low strain capacity; however, these structural properties could be improved by addition of fibers, allowing the thickness of the layer to be reduced. There are different fibers that are used in the concrete namely steel fiber, synthetic fibers and natural fibers. The improvement in the material behavior of the fiber reinforced concrete depends on dosage and characteristics of the used fibers [1]. The main important effect of fibers as reinforcement is to influence and control the tensile cracking of concrete. Yet, the fiber reinforced concrete is known to have considerable impact on the slab cost owing to reduced thickness needs, prolonged useful life and reduction in maintenance costs. Amongst the fibers mentioned, steel fibers are the most researched and more practical. Steel fiber reinforced concrete is a type of concrete that contains randomly oriented discrete steel fibers [2]. The main aim of addition of steel fibers to concrete is to control crack widening and crack propagation after the concrete matrix has cracked. By control of the cracking the mechanical properties of the composite material as a result will be improved significantly. Addition of randomly distributed steel fibers improves concrete properties, such as static flexural strength, ductility and flexural toughness. Steel Fiber Reinforced Concrete (SFRC) has been largely used in airport pavements due to the extreme and damaging loads acting on the pavement. The ability of steel fibers to resist crack propagation is primarily dependent on the bond between the concrete and fibers as well as fiber distribution (i.e. spacing