

Polypropylene Fiber Concrete Incorporating Crushed Tire Waste: A Mechanical Assessment

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Abstract

Concrete is a commonly used construction material, usually consisting inert materials such as gravel and sand, which are bound with water along with cement. This research evaluates the combination of recycled crumb rubber (CR) and polypropylene fiber (PPF) from single-use protective suits (SUPS) to improve the mechanical characteristics of concrete in considering rising environmental issues and to increase sustainability. Crumb rubber particles (300–425 μm) were used as a partial replacement for fine aggregate at a constant dose of 0.5% by weight of the entire mixture. PPF strips (5 x 20 mm) have been used with various percentages of 0.2%, 0.3%, and 0.4% of the total volume. Concrete specimens were cast and tested for compressive strength, split tensile strength, flexural strength after 14 and 28 days. Compressive and tensile tests were conducted on cylindrical specimens (6" x 12"), while flexural strength was evaluated by prismatic beams (20" x 4" x 4"). In comparison with the control mix, the mix consisting of 0.5% CR and 0.2% PPF performed most effectively, increasing compressive strength by 8.14%, flexural strength by 6.26%, and split tensile strength by 6.36%. The research conducted that using waste CR and PPF together is an effective way to enhance concrete's mechanical characteristics while increasing green construction and waste reduction.

Keywords

Crumb Rubber, Polypropylene fiber, Compressive Strength, Split Tensile Strength, Flexure Strength and Sustainability.

Biographies

Irin Hoque is an undergraduate student in the Department of Civil Engineering at Southern University Bangladesh (SUB), Chattogram, Bangladesh. Besides academic, her research interests include Structural Analysis, Materials, Machine Learning and AI. She has also participated in various co-curricular activities, serving as campus program organizing, Cultural programs, Some competitions and Sports. Beyond academics, she is passionate about learning and using technology in real life to solve challenges. she is currently doing research on high strength concrete using machine learning after her recent work.

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