

Experimental Study on Some Fresh and Mechanical Properties of Polypropylene Fiber Reinforced Self Compacting Concrete

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Abstrak

Self Compacting Concrete (SCC) merupakan jenis beton yang mampu mengalir dan memadat dengan memanfaatkan berat sendirinya, serta dapat mengisi secara homogen cetakan meskipun dalam kondisi penulangan yang rapat tanpa memerlukan pemadatan. Sebagaimana karakteristik beton pada umumnya, SCC juga bersifat getas. Untuk mengatasi kelemahan ini, dapat dilakukan penambahan serat guna meningkatkan kekuatan tarik dan ketahanan retak beton. Penelitian ini dilakukan untuk mengetahui efek penambahan serat polypropylene terhadap empat karakteristik utama beton segar SCC, serta pengaruhnya terhadap kuat tekan, kuat tarik belah, dan ketahanan kejut SCC. Penambahan serat polypropylene dilakukan dengan volume fraction sebesar 0%, 0,05%, 0,1%, dan 0,15%. Dalam penelitian ini, akan dilakukan pengujian beton segar yang meliputi: flowability (slump-flow), viscosity (T500), passing ability (J-Ring Test), dan ketahanan segregasi. Sedangkan karakteristik beton yang diuji meliputi kuat tekan, kuat tarik belah, dan ketahanan kejut beton. Penambahan serat polypropylene menyebabkan berkurangnya flowability/filling ability, passing ability, dan rasio segregasi SCC sedangkan nilai viskositas SCC meningkat. Karakteristik beton segar SCC masih dapat dicapai saat serat polypropylene ditambahkan sebesar 0,10% dari volume beton. Penambahan serat polypropylene dapat meningkatkan kuat tekan, kuat tarik belah, dan ketahanan kejut beton. Penambahan serat polypropylene ke dalam adukan SCC dapat dilakukan dengan nilai optimum volume fraction sebesar 0,10%.

Kata kunci: Polypropylene, Self-Compacting Concrete (SCC), Sifat Mekanik

Abstract

The Self-Compacting Concrete (SCC) can be defined as a type of concrete that able to flow and consolidate under its own weight, completely fill the formwork even in the presence of dense reinforcement, maintaining its homogeneity and without the need for any additional compaction. Similar with other types of cement-based materials, SCC also has a brittle characteristic. This research was conducted to investigate effects of polypropylene fiber addition on four key characteristics of SCC in the fresh state, and assess the effects of polypropylene fiber on compressive, splitting tensile strength, and impact resistance of hardened SCC. In this research, concrete mixes were prepared containing 0, 0.05, 0.10, and 0.15 percent of volume fraction. Fresh properties were evaluated based on its passing ability, flowability, viscosity, and segregation resistance using J-ring, Slump flow, and Sieve Segregation Resistance tests. After 28 days of curing, compressive strength tests, Brazilian splitting tensile, and drop-weight impact resistance were done. It can be found polypropylene fibers reduce flowability and passing ability but will increase viscosity and segregation ratio of SCC. Furthermore, it can be concluded that polypropylene fiber reduce deformability of SCC in the fresh state. After 28 days of curing, concrete samples tests indicate that polypropylene fiber addition increasing compressive strength, tensile strength, and impact resistance of hardened SCC. It can be suggested that polypropylene fibers allowed to be added into SCC mixes up to 0.10 percent by volume of concrete.

Keywords: Mechanical Properties, Polypropylene, Self-Compacting Concrete (SCC)