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Rheology of synthetic-fiber reinforced SCC

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ABSTRACT

Casting concrete segments with fiber reinforced self-compacting concrete (FRSCC) eases the production process. The simplest way to produce a concrete element is to prepare a mould, cast the concrete and finish it, without placing any reinforcement bars or vibrating. FRSCC can combine the benefits of SCC in the fresh state and shows an improved performance in the hardened state due to the addition of fibers.

Until now, the use of structural fibers made of steel, even though it could have been beneficial, is limited. Accounting for that is the quite poor workability of concrete reinforced with steel fibers. This has led to a market trend of trying to avoid the use of structural steel fibers, even when needed. The obvious advantage of plastic structural fibers in concrete is that they are flexible, and therefore do not have such a negative effect on the workability. The research described could consequently lead to a step forward in concrete technology by proving the applicability of these fibers without loss of concrete properties. The fibers investigated are novel polymeric synthetic macro reinforcing fibers. They are monofilament fibers with a quadrilateral cross-section, manufactured from a synthetic polymer blend.

The effects on the workability when using synthetic structural fibers are identified and interpreted. The research results are based on mortar and concrete tests, in which the consistency was tested with a coaxial cylindrical viscometer in terms of yield value, τ_0, and plastic viscosity, μ. Different mix designs were evaluated by varying different mix components (e.g. w/c-ratio, silica fume content, etc.) with special respect to variable fiber contents. In the research the point of interest was not only the interaction between the fibers and varied mix compositions, the workability behavior of the fibers itself was of additional interest as well.