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An investigation into the influence of silica fume on the performance of concrete

Raziskava vpliva mikrosilike na obnašanje betona

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Abstract

This paper presents the results of an experimental investigation into the effect of an industrial waste material, silica fume, on the performance of concrete at a curing condition of 20°C and 100% relative humidity. The effect of the silica fume on both fresh and hardened states was assessed. Six mixes were produced and were categorised in accordance with the amount of silica fume and the water to cement ratio present. The properties investigated were the workability, compressive strength, and the quality of the concrete cubes through the use of the density test and the Ultrasonic Pulse Velocity test (UPV) at ages of 1, 7, 14 and 28 days. From the data obtained from the various experiments, the results for the silica fume concrete were compared against the control concrete specimens to understand the effect of silica fume on the performance of the concrete.

The main conclusion drawn from the experimental investigation is that silica fume improves the early strength development of the concrete and has a higher ultimate strength due to its pozzolanic properties.

Key words: Silica fume, workability, compressive strength, Ultrasonic pulse velocity, pozzolanic properties.

Povzetek

V članku so predstavljeni rezultati eksperimentalne raziskave vpliva dodatka industrijskega odpadnega materiala silicijevega prahu - mikrosilike na obnašanje betona pri staranju pri 20°C in 100% relativni vlažnosti. Opažen je bil vpliv mikrosilike na stanje v času pred in po strjevanju. V raziskavi je bilo uporabljenih šest različnih mešanic, ki so bile kategorizirane glede na delež dodane mikrosilike in vodo cementni faktor. Pri tem so bile zasledovane naslednje lastnosti obdelovalnost, tlačna trdnost in kvaliteta betonskih prizem z uporabo testa gostote in testa z določitvijo ultrazvočne hitrosti vzorcev po 1, 7, 14 in 28 dneh staranja. Iz rezultatov različnih raziskav, z dodatkom mikrosilike in brez lahko zaznamo vpliv mikrosilike na obnašanje betona.

Glavni zaključek eksperimentalnih raziskav uporabe mikrosilke se nanaša na izboljšanju začetne in končne trdnosti betona zaradi njenih puzzolanskih lastnosti.

Ključne besede: mikrosilika, obdelovalnost, tlačna trdnost, ultrazvočna hitrost, puzzolanske lastnosti.