

Viability of cellulose nanofibre powder and silica fume in self - compacting concrete rheology, hardened properties, and microstructure

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This research investigated the influence of adding cellulose nanofiber (CNF) on the rheology and hardened properties of self-compacting concrete (SCC). The CNFs were produced from wastepaper through chemical treatment and added as 0.25%, 0.50%, 1%, 2%, and 3% by weight of cement in SCC. The results revealed that the increase in the content of CNF caused the decrease in slump flow diameter (SFD), and the lowest SFD of 600 mm was achieved at 2% CNF. In addition, the T50 flow and unit weight increased with the increase in the content of CNF, and the maximum values of 5 s and 2.6 kg/m³ were achieved at 2% and 3% CNF, respectively. Furthermore, the compressive strength increased with an increase in curing age and CNF content (until 0.5%), and the maximum value of compressive strength was achieved as 89 MPa for 0.5% CNF at 28-days of curing. The dry density results increased with the increase in CNF contents at 7-days of curing. The ultrasound pulse velocity and strength ultrasound decreased with the increase in CNF contents. The results showed that the inclusion of CNF improved the microstructure and formed crack bridging. In conclusion, CNF (up to 0.5%) can be used for the production of SCC.