 Proceedings of ICCES'08, pp.1485-1485

Effects of Aggregate Variation on the Fresh and Hardened Properties of an Ultra-High-Performance Concrete

Todd S. Rushing, Toney K. Cummins, Charles A. Weiss, Toy S. Poole

Summary

An ultra-high-performance portland-cement mortar mixture proportion was selected for study. The original mixture contained natural concrete sand as its aggregate and further comprised silica fume, finely ground silica, portland cement, polycarboxylate admixture, and water. The mixture provided a workable material yielding compressive strengths in excess of 200 MPa in the hardened state. Various industrial aggregates ranging in particle geometry and mineralogy were substituted for the natural sand in the mixture, and the effects of the changes were investigated. The selected aggregates had similar particle size gradations and included natural Ottawa sand, crushed quartz, aluminum oxide, and silicon carbide. For each mixture, the mixing time to achieve a wetted state was recorded, and a flow table test was conducted. The hardened state was characterized by unconfined compression testing of 2-inch cubes. Additionally, a thin section of each material was prepared, and the paste-aggregate interfaces were analyzed by light microscopy and scanning electron microscopy. Though the aggregate type exhibited little effect on compressive strength, variations in the water demand of the mixture were observed. Mixing times before wetting were longer for aggregates having greater surface areas and likewise for those having more hydrophilic mineralogies. Results of the microscopic analyses will be included in the completed study.