

Rheology of High Performance Cement-Based Materials For Use in Additive Manufacturing

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ABSTRACT

In this presentation I will discuss preliminary results concerning the rheology of certain ultra high performance cement-based materials. Both experiment and computer simulation will be utilized to predict the rheological behaviour. We will take a multiscale approach treating the cement paste as a continuous medium with fibers and sand added to make a mortar. Experimental data of the rheological behavior of the matrix cement paste will be used as input into a smooth-particle-hydrodynamics (SPH) based simulation of suspensions. The SPH simulation will model the effect of fiber and sand that are added to the cement paste. The fiber material properties (e.g. elastic and flexible vs. stiff) and sand volume fraction will be varied for a given sand size distribution based on a standard Ottawa sand. The sand will be modelled as spherical inclusions. Simulation results will be compared to available experiment data. Based on the simulations we will comment on the suitability of such materials for use in additive manufacturing and discuss challenges of using such materials.

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