Adsorbing polymers and viscosity of cement pastes

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Abstract

In this paper, we study the physical mechanisms at the origin of a decrease in viscosity of concentrated cement pastes containing adsorbing polymers. We suggest from our results, similar to other authors, that plasticizers are able to decrease viscous dissipation by modifying the flocculation state of the system, which, in turn, impacts the way shear localizes. Our experimental results suggest that shear concentrates in fluid layers, the thickness of which scales with the surface-to-surface separating distance between cement grains imposed by the adsorbed polymer conformation. These effects being identical for all polymers, we suggest that the residual difference between polymers in the final macroscopic viscosity comes from the more or less pronounced increase in the local viscosity of the interstitial fluid between neighboring particles. This increase could either be correlated to the concentration of non-adsorbed coils in the interstitial fluid or to the local concentration of adsorbed coil side chains.

Keywords: Admixture, Adsorption, Rheology, Dispersion, Viscosity

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Obtaining rheological parameters from flow test — Analytical, computational and lab test approach

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Abstract
In the mix design process of cementitious suspensions, an adequate rheology of the cement paste is crucial. A novel rheological field test device for cementitious fluids is presented here and investigated theoretically, by computer simulation and by lab tests. A simple flow stoppage test with a timed spread passage point provides accurate rheological parameters according to the Bingham material model. Values for yield stress and plastic viscosity are obtained for a test specimen of no more than $19.75 \cdot 10^{-6}$ m^3 of fluid. This volume is equivalent to 19.75 g of water at room temperature. Such a small volume allows reliable tests even for small amounts of fillers. Promising results show that both yield stress and plastic viscosity can be determined by this simple test. This novel rheological test method also enables the correlation of different rheological equipment used by different laboratories.

Keywords: Simulation; Cement paste; Workability Bingham material model; Rheology; Modeling, Mortar

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