

Influence of the Granular Mixture Properties on the Rheological Properties of Concrete: Yield Stress Determination Using Modified Chateau et al. Model

Authors : Rachid Zentar, Mokrane Bala, Pascal Boustingorry

Abstract : The prediction of the rheological behavior of concrete is at the center of current concerns of the concrete industry for different reasons. The shortage of good quality standard materials combined with variable properties of available materials imposes to improve existing models to take into account these variations at the design stage of concrete. The main reasons for improving the predictive models are, of course, saving time and cost at the design stage as well as to optimize concrete performances. In this study, we will highlight the different properties of the granular mixtures that affect the rheological properties of concrete. Our objective is to identify the intrinsic parameters of the aggregates which make it possible to predict the yield stress of concrete. The work was done using two typologies of grains: crushed and rolled aggregates. The experimental results have shown that the rheology of concrete is improved by increasing the packing density of the granular mixture using rolled aggregates. The experimental program realized allowed to model the yield stress of concrete by a modified model of Chateau et al. through a dimensionless parameter following Krieger-Dougherty law. The modelling confirms that the yield stress of concrete depends not only on the properties of cement paste but also on the packing density of the granular skeleton and the shape of grains.

Keywords : crushed aggregates, intrinsic viscosity, packing density, rolled aggregates, slump, yield stress of concrete

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