EFFECT OF SP TYPE ON ETTRINGITE MORPHOLOGY AND ON THE RHEOLOGY OF PORTLAND CEMENT MORTARS AS A FUNCTION OF TYPE OF ADDED CALCIUM SULFATES

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ABSTRACT

Concrete technology has improved, widening the range of applications of this material. For instance, high performance properties such as high fluidity have been in great demand in concrete technology over the last few years. Therefore, a number of new superplasticizers (SP) have been developed and applied to important construction projects. In this regard, polycarboxylate-type superplaticizers (PCP) have been more widely used recently.

In order to have more insights on the effect of the PCP-type SP as a function of the nature of added sulfates on Portland cement fluidity, a comparative study has been carried out in 2 steps.

In the first part of the study, the effects of a common polynaphtalenesulfonate (PNS) - type SP and of two PCP - type SP on the formation of ettringite have been compared. The ettringite has been prepared on mixing solutions of $Al_2(SO_3)3$ and $Ca(OH)_2$ in presence or not of SP. The morphology of ettringite been examined by SEM and the SP adsorption has been monitored.

In the second part of the study, the effect of the 3 SP's as a function of the nature of added calcium sulfates (gypsum, plaster, anhydrite) and C_3A content (2 levels considered) in Portland cement has been compared through the early rheological behavior of mortars at a W/C of 0.5. Concurrently, early SP adsorption has been measured in the mortars.

Overall, the disturbance of the ettringite morphology is somewhat different between the SP's : an ill-defined mass being observed in presence of PNS and small needles in presence of PCP-type SP compared to long and sharp needles in the reference mixture without SP. Moreover, the adsorption of the PCP-type SP on the ettringite is lower when compared to the PNS type SP.

The rheological results on mortars indicate that, for high C_3A level, the early fluidity increases as a function of the calcium sulfates solubility rate regardless of the type of SP. When the C_3A level is lower, dosage of SP is reduced and the cement dispersion is less sensitive to the nature of added calcium sulfates regardless of the type of SP.