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Abstract

Type of cement and its compactibility with carboxylates superplasticisers

The superlasticisers have a great significance in the development of concrete technology of new generation. However, the interactions in the system cement-superplasticiser is not fully understood. It is probably partially caused by utilization in research industrial cements which have a very changeable chemical & phase composition, for example concentration of solid solution in C_3A and its reactivity, sulfate and potassium content in clinker and their etc.

To overcome these difficulties two clinkers of well defined chemical and phase composition were prepared. One contained no C_3A (C1), second 9% of this phase (C2), both with very low Na_2O_e, about 0.1% These clinkers ground to about 340 m^2/kg were used with two additions i.e. gypsum and complex Klein. Complex Klein was added in the quantity to assure the same content of ettringite after 0.5 and 1 h of cements hydration as in the case of cement C2 + gypsum. As the superplasticisers carboxylates were applied.

The rheology measurements have shown that the yield value is increasing in the order: C1, C1 + gypsum, C1 + complex Klein + gypsum, C2 + gypsum. The yield value is increasing quickly with time for all pastes, the only exception is C1, for which it is practically constant till 120 min. Plastic viscosity is increasing in the order C1 + gypsum, C1 + complex Klein + gypsum, C1, C2 + gypsum after 10 min. After 1 h the order is C1 + gypsum, C1 + complex Klein + gypsum, C2 + gypsum and C 1. X-ray examination has shown that the ettringite content is nil in C1 paste of C1 + gypsum has a small quantity of this phase after 20 min and is increasing to 3% after 30 min and remains constant till 90 min. and the situation is very similar in paste C1 + complex Klein + gypsum. However the quantity of ettringite is 1% higher in the paste of C2 + gypsum, but also remains practically constant till 90 min.

Heat of hydration measured by microcalorimetry gives the increasing sequence; C2 + gypsum, C1 + complex Klein + gypsum, C1 + gypsum and C1. The degree of hydration is related to cement phase composition i. e. its reactivity towards water and has small influence on rheology in the very beginning of cement reaction with water.

Reassuming we can conclude that the yield value of the paste is correlated with ettringite formation, but there is no such simple relation in case of plastic viscosity. However, the changes of plastic viscosity of cement pastes are in some manner opposite to the yield value.

From these results is evident that, in case of very low sulfate and potassium in clinker, the rheology of cement paste is controlled by the formation of ettringite.