



Basics of analytical methods used for the investigation of interaction mechanism between cements and superplasticizers

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ABSTRACT

In order to better understand the interactions between cements and superplasticizers (high-range water reducers), various analytical methods have traditionally been applied, but some of these methods can introduce significant errors. In this paper the fundamental interaction mechanisms are reviewed and appropriate methods and sample preparation conditions are explained in detail. For superplasticizer adsorption measurements, analysis by size exclusion chromatography is useful in order to avoid the effect of other organic compounds released from cement by the action of the superplasticizer. For BET specific surface area measurements it is important to avoid pre-drying at over 60 °C, as otherwise ettringite can decompose and strongly increase the surface area. In order to evaluate pore solution chemistry correctly the aqueous phase must be extracted without dilution. In addition, the fluidity performance of many cements in superplasticized concretes can be changed simply by passage through a storage silo, for reasons which are not yet understood.

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1. Introduction

The understanding of interactions between cement and superplasticizers (SP) has been a big concern in the field of cement and concrete science. There have been numerous studies on this topic [1–5]. However, obviously some studies contain obscure points from the viewpoint of reproducibility and appropriateness of analytical methods. In this review, fundamental interaction mechanisms between cement and SP are

summarized and basics of analytical methods relating to them are critically reviewed. Although everyone may know the importance of these analytical methods, the number of researchers who know the detailed conditions or requirements for such measurements may be limited.

2. A summary of basic analytical methods and the fundamental working mechanisms of SP

2.1. Amount adsorbed

In general everyone will agree with the simple concept that superplasticizers or plasticizers work as a dispersants mainly after

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