

Setting Properties of High Aluminate Composite According to Various Temperature and Components

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Abstract

Among all the slags, ladle furnace slag (LFS) is reducing slag generated from electric arc furnace. After cooled rapidly by high-pressure air (atomizing technology), LFS has more amorphous phase than slow cooled slag. Therefore it shows higher reactivity than another recycling slag. This material also is named by rapid cooling LFS (RC-LFS). Pulverized RC-LFS should be fully understood. This paper deal with the present some basic experimental properties and discussions about the setting time of pulverized RC-LFS with different gypsum under the various temperatures. According to the experimental results, the pulverized RC-LFS with gypsum can hydrate in a low-temperature environment, even though the initial and final setting time are delayed.

Keywords : pulverized RC-LFS, setting time, various temperature

1. Introduction

High calcium aluminate cement also be introduced as rapid hardening cement, which has remarkable contributions to the special engineering projects, when high early strength are needed. Recently, the experimental study of producing rapid hardening cementitious material by recycling slag or industry by-products draws many attentions. After special treated, pulverized slag could contribute on enhancing the properties of cementing system. According to the previous researchers [1,2], pulverized RC-LFS of fineness 6300 g/cm^3 can hydrate rapidly and its speed is depending on the amount of $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$ (C_{12}A_7) and $\beta\text{-C}_2\text{S}$. However, because of rapid hydrate speed, the heat during the hydrating process is also huge. It is needed to be clear the hydration behavior in various ambient temperature. Therefore, this paper deals with the present some basic experimental properties and discussions about the setting time of pulverized RC-LFS with different gypsum under the various temperatures.

2. Experimental study

2.1 Experimental plan

The purpose for this experiment is to illustrate the properties of setting test of pulverized RC-LFS with different gypsum by various temperatures. The experimental plan shows Table 1.

2.2 Material

The chemical properties of pulverized RC-LFS is listed in Table 2.

3. Experimental results and discussions

The setting test results as shown in Figure 1. According to the result, after temperature increased to 30°C , the time of initial setting and final setting show extremely shortened of all five mixtures when to compare to 0°C . Obviously, the environmental temperature will strongly influence the hydration of the calcium aluminate composite. Under the high temperature environment, the molecular motion will be accelerated, thus the hydration rate will also be increased, even though the impact on the initial setting time and final setting time show a little different, the general tendency is same.

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Table 1. Experimental plan

Mixture ID	Binder	w/b (%)	Factor of experiment (°C)	Test item
RHHC 100	RHHC (100%)	40	0	Setting time
CAC 100	CAC (100%)		5	
Ace.100 HG	CAC(75%) + HG(25%)		10	
Ace.100 DG-1	CAC(70%) + DG-1(30%)		20	
Ace.100 DG-2	CAC(70%) + DG-2(30%)		30	
Ace.100 DG-3	CAC(70%) + DG-3(30%)			

Table 2. Oxide content (Wt. %) of pulverized RC-LFS

SiO ₂	CaO	Al ₂ O ₃	Fe ₂ O ₃	MgO	SO ₃
10.9	44.5	26.6	4.3	6.6	-

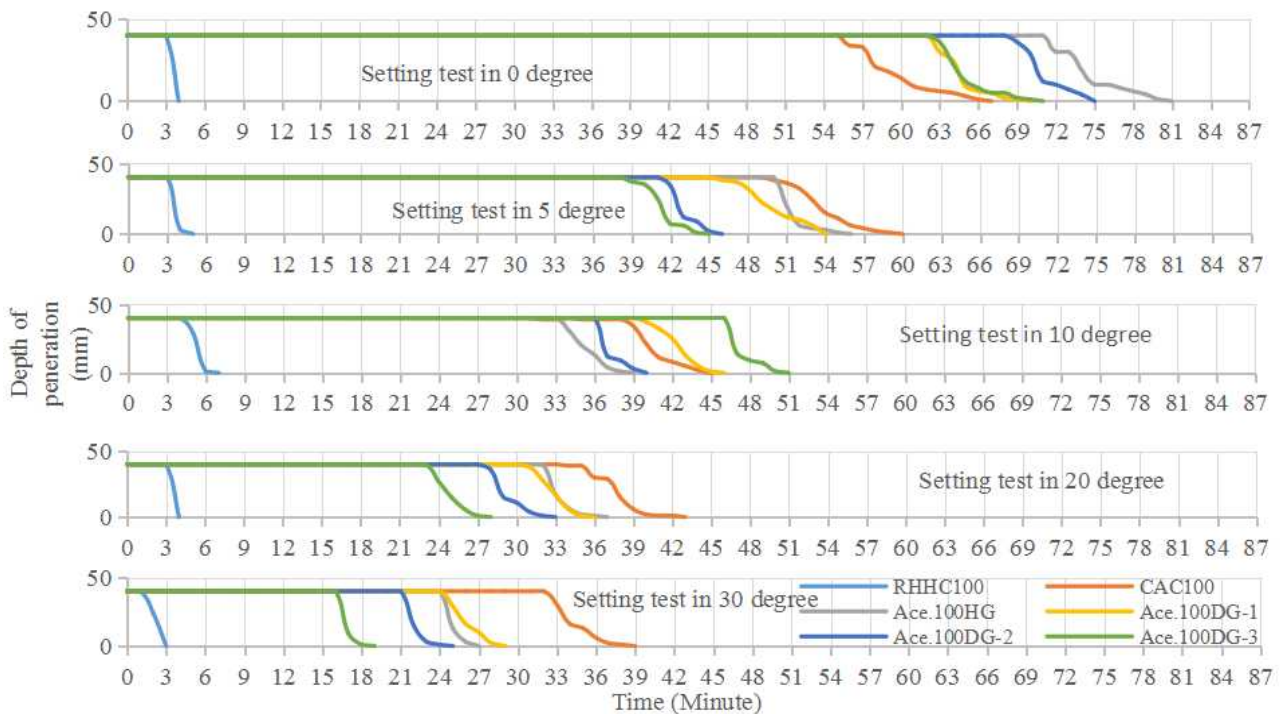


Figure1. Experimental results

4. Conclusions

RHHC will hydrate extremely rapid. Both hemihydrate gypsum and dehydrate gypsum are contribute on control the setting time, Pulverized RC-LFS with gypsum or another retarder is more suitable to hydrate under the low-temperature environment.

감사의 글

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