

나노 TiO₂를 혼입한 시멘트 페이스트의 압축강도 연구

The study of the compressive strength of cement pastes containing nano-TiO₂

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Abstract

This paper has been researched that the earlier compressive strength of the cement pastes containing nano-TiO₂ particle curing 1day, 3days and 7days. For the compressive strength measurements, all samples(dimensions 50×50×50mm) were prepared in accordance with ASTM C109. The compressive strength of the specimens with nano-TiO₂ at the early age(1day, 3days and 7days) stage was lower than that of the reference group. Therefore, nano-TiO₂ has little positive effect on the improvement of the compressive strength of cement pastes during early ages.

keywords : cement paste, the earlier compressive strength, nano-TiO₂

1. Introduction

The nano-TiO₂, as a new multi-purpose material, although has been discussed diffusely on the depollution and self-cleaning performance. And some research has been examined the effects of nano-TiO₂ on the inherent properties of the cement hardened cement pastes.¹⁾ This paper has been researched that the earlier compressive strength of the cement pastes containing nano-TiO₂ particle curing after 1day, 3days and 7days.

2. Experimental

2.1 Sample preparation

Ordinary Portland Cement(OPC) ASTM Type I and nano-TiO₂ are used as cementitious materials. All pastes were made in the laboratory for this study. The specimens were then divided into three groups of three specimens each so as to test all groups simultaneously. The mix proportions of the pastes are listed in Table1. A constant w/b ration of 0.2 was used for all samples. All samples were cast in 50×50×50mm steel moulds and sealed with plastic film, then demolded after 24h in an environmental chamber curing at around 20±3°C and 90±5%RH.

Table 1. Mix proportions for blended cement pastes (per 100g of cementitious material comparison)

Sample ID	nano-TiO ₂ (% solid content by weight)	Cement(g)	Water(g)	Super plasticizer(g)	w/b
0%TiO ₂	0	100	20	1.1	0.2
3%TiO ₂	3	97	20	1.1	0.2
6%TiO ₂	6	94	20	1.1	0.2

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2.2 Compressive strength

The earlier compressive strength measurements of the cement pastes were conducted after 1 day, 3days and 7days of curing in accordance with ASTM C109.²⁾ The average value of three replicates was taken as the representative value. The results of earlier compressive strength development in relation to nano-TiO₂ addition levels are shown in Figure 1.

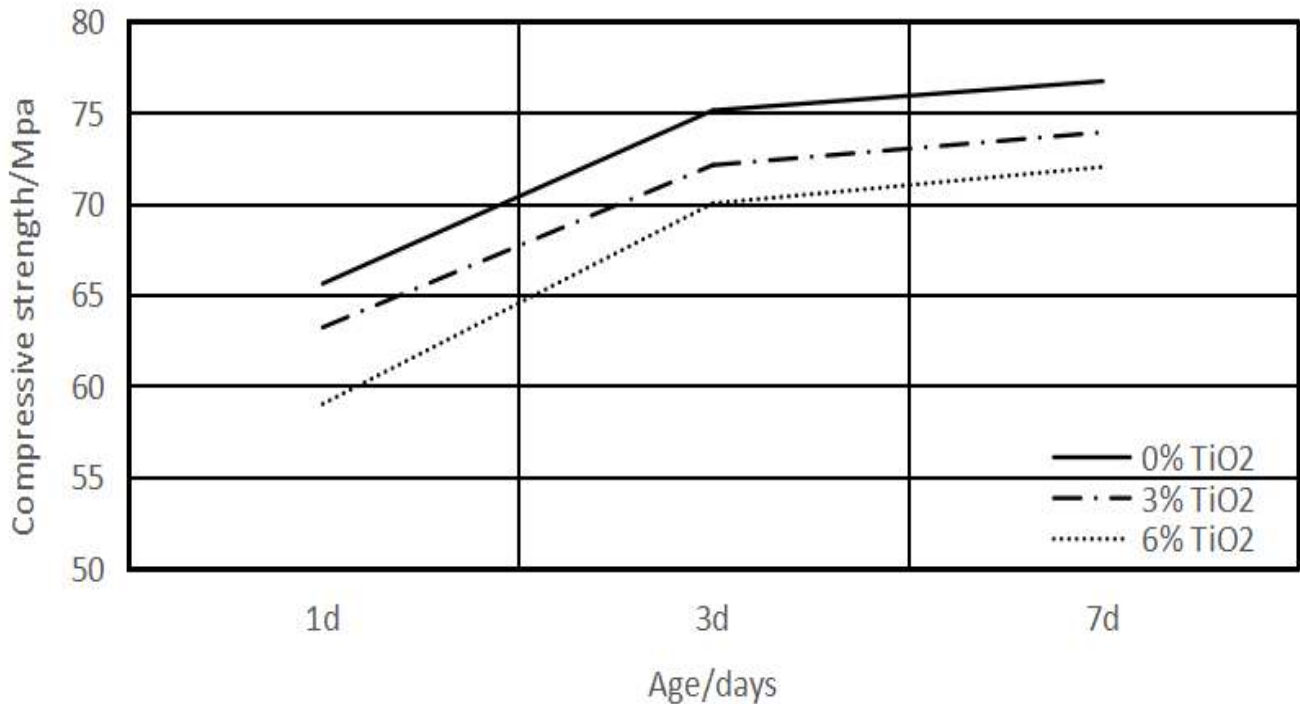


Figure 1. Compressive strength development.

3. Conclusions

The influence of adding nano-TiO₂ on earlier compressive strength of the cement-based materials was identified through this experimental studies. The earlier compressive strength of the specimens with nano-TiO₂ at the early age(1day, 3days and 7days) stage was lower than that of the reference group, due to the replacement of part of the cement by nano-TiO₂ particles.

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References

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