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Research of Polyocarboxy Acid Water-reducer With Modified Ployether and its Effect on Concrete's Workability

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Abstract In this paper, polycarboxylic type high performance water reducers have been synthesized through using TPEG modified monomer. If synthetic temperature and addition time of copolymer monomers can be controlled, the performance of polycarboxylic superplasticizer will be improved. Testing results indicates that when temperature is at 60~65ºC, addition time of copolymer monomers is three hours, the performance of superplasticizer H Liq C - (HPLC) almost the same with the famous brand abroad of the same type. The ues of polycarboxylic type high performance water reducers cooperated with naphthalene series high range water reducing agents thereby markedly improv the workability of concrete mixture.

Introduction

The molecular structure of polycarboxylic superplasticizer is changeful and tunable. It can be changed through changing the factors influencing on the performance of the reducer, such as , - ength, the dosage of initiator, the kind and dosage of chain transfer agent, the temperature and the reactive time. On the basis of referential review of domestic and foreign bibliography [1-5], the admixture with High Degree of Polymerization backbones and short branches has good slump retention ability. The admixture, in contrast, and with a lot of -SO_3H - compatibility with cement.

Monomer largely determines the performance of polycarboxylic type high performance water reducers. So we choose modified ployether TPEG synthesiz the admixture. Through the choice of reasonable ratio of monomers and controlling of temperature and the monomer dropping speed we have controlled the performance of polycarboxylic type high performance water reducers well.

Synthesize of Polyocarboxy Acid Water-reducer

Raw materials

Modified ployether TPEG; ; ; ; acid

Synthetic process

Modified ployether, deionized water, are put into a 4_ k 5ºC and then drop other monomers and chain transfer agent progressively, reacted for 3h, followed by temperature remains unchanged for 1.5 hour and then neutralized and a lot of water is put into the 4_ k

We keep the quantity of monomer, initiator and chain transfer agent unchanged, then discuss the influence of synthesize temperature and the dropping speed of poly monomer to the performance of polyocarboxy acid water-reducer.

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Control of synthesize temperature.

Temperature is a very important factor in free radical chain polymerization reaction. In this paper we choosed the condition of the reaction temperature at 55ºC,60ºC,65ºC,70ºC,75ºC, get results showed in Table 1.

Table 1 Performance of admixture at different temperature

Temperature[ºC]	the flowability of neat cement [60min]/mm	flowability of neat cement [60min/mm
55	240	200
0	270	250
5	270	280
70	240	250
75	200	160

Testing results in Table 1 showed that the performance of admixture was excellent when the temperature was at 60~65℃. Especially when at 65℃, the initial flowability of neat cement was 270 W erature was higher or lower the performence W 70℃, the flowability of cement net of one hour improved. It may be because when at 60~65, the initiator was at the most proper decomposition temperature. When it decreased the initiator decomposed very slowly, then affected the chain polymerization of admixture. While on the contrary, initiator decomposed in very short time, the chain of admixture would be very short. So slump retention ability could get affect.

Controller of synthesis addition time of copolymer monomers

Table 2 Performance of admixture with different addition time

Addition time[hour]	flowability of neat cement [ ]/	flowability of neat cement [60min]/mm
2	210	180
2.5	260	250
3	270	260
3.5	260	250
5	250	220

Testing results in Table 2 showed that the performance of admixture was excellent when the addition time was for about 2.5~3.5 hours. Especially for 3 hours, the initial fluidity of cement net was 270mm and almost no fluidity loss after one hou W 2 W 3.5 urs, the performance had no improvement and when for 5 hours the slump retention ability became poor. It may be because when the time was short, the chain polymerization of admixture was deficient. When the time became long, some side chains shed off, while the costs increased.

Properties tests of admixture

Microcosmic performance test

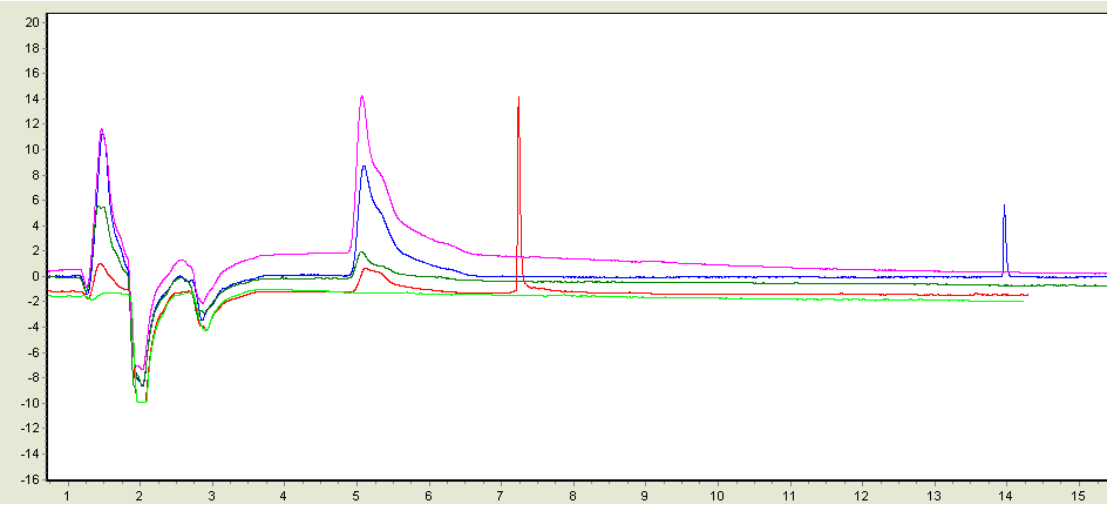

Fig. 1 curve of different admixture

From Fig.1, we can find that our modified admixture's graph is almost the same with the famous brand abroad 3.

Concrete tests We chose concrete of C50 to do tests.

Test materials.

Cement: P.O52.5; S C

M : from Luxin M

F : from H

W :

Admixture: polycarboxylic type high performance water reducers from abroad and own

S : ; Mx=2

Gravel: 5-25mm; powdered stone

Concrete Mix Ratio The concrete mix ratio is as Table 3.

3 Concrete Mix R [kg/m^3]

strength grade	cement	mineral powder	Fly ash	sand	grate	water
C50	380	60	60	752	1180	165

Table 4 Concrete test results

test	Dosage of admixture (percentage of cementing materials)	Slump[mm]		working condition	
			0		0
1	0.22%	250	220	good fluidity, gravels show out and paste bleed	good fluidity, good workability
2	0.2%	240	170	good fluidity, gravels show out and paste bleed	flowing with little speed, slump loss a lot
3	0.18%	220	150	good work condition, excellent workability	no flowing, large slump loss
4	0.15%	200	100	good work condition, excellent workability	no flowing, large slump loss

C 4 n the dosage of the admixture was larger the initial condition of the concrete mixture showed good fluidity but the bigger gravels showed out and cement paste bleed. However when the dosage was lower the initial condition was excellent but the concrete slump loss was large.

S YQ, HJ, HN, -C, introduced into the admixture to do concrete tests. We chose the dosage of admixture was all 0.18% of cementing materials. The results were listed in Table 5.

Table 5 Compounds Test Results

test	Dosage of auxiliary material [ppm]				28d [M]	working condition	
	YQ	HJ	HN	-C			0
1	3.5	25	42	_	52	good fluidity, gravel shows and bleeding	flowing with little speed, slump loss a lot
2	4.5	45	45	_	47	good fluidity, good workability	flowing with little speed, a little slump loss
3	5.5	48	48	_	44	good fluidity, a little bleeding	excellent station, no slump loss
4	2	25	40	10	60	good fluidity, good workability	excellent station, no slump loss

The results in Table 4 indicated that when introduc YQ, HJ, HN 3.5ppm, 25ppm, 42 initial condition of concrete mixture could not get any improvement. While incresing the dosage of auxiliary materials, the strength reduced a lot. The ues of polycarboxylic type high performance water reducers cooperated with naphthalene series high range water reducing agents thereby markedly improved the workability of concrete mixture while without 28d strength reduction.

Conclusions

W 0~65ºC n time of copolymer monomers was for 3 hours, the reducing performance of water reducer is best.

H Liquid C - (HPLC) tests, we can find that our modified admixture's graph is almost the same with the famous brand abroad 3.

The ues of polycarboxylic type high performance water reducers cooperated with naphthalene series high range water reducing agents thereby markedly improv the workability of concrete and no strength reduction after 28 days.

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