EFFECT OF POLYMERY MONOMORES ON THE STRENGTH OF OLD AND CONCRETE CONCRETES

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ANNOTATION

The article presents the results of experimental studies conducted to study the effect of the polymerizing methyl methacrylate monomer on the adhesion strength of old and new concrete. It is shown that upon impregnation of methyl methacrylate monomer in contact joints and its polymerization, the adhesion strength of old and new concrete increases several times.

KEY WORDS: *contact seams, monomer, polymer, methylmetrylate, strength, polymerization, impregnation, initiator, new concrete, old concrete, adhesive strength, benzoyl peroxide, pores.*

INTRODUCTION

Since the 50s of the twentieth century, polymeric materials are polymer concrete and concrete so-called polymers are used in the manufacture of concrete products and structures with improved quality [1]. These two new materials differ only in production methods. In the first, a polymer or monomer is used as a binder for concrete, while in the second, ready-mixed concrete structures are impregnated with monomer compounds and polymerized in concrete pores. The polymer hardened in the pores of concrete reduces porosity, increases strength, density, water resistance and other indicators.

Styrene and methyl methacrylate are often used as impregnated monomers [2] Currently, many scientific studies on polymer concrete and concrete polymers have been conducted by domestic and foreign scientists [3,4,5]. All of them cover the properties of polymer concrete and ready-made structures of concrete polymers, production technology, research problems of applied polymers, and do not pay enough attention to the treatment of old and new concrete joints in the repaired structure with polymerized monomers. Therefore, we conducted experimental studies to study the effect of impregnation of polymerizable monomers on the strength and porous structure of old and new concrete joints.

METHODOLOGY

In studies, methyl methacrylate monomer was used as the absorbing component.

Methyl methacrylate is a methyl ester of methacrylic acid, which undergoes polymerization to form a polymethyl methacrylate polymer in a linear structure:

$$n\,CH_2 = C(CH_3) - COOH_3 \rightarrow [\,-\,CH_2 - \underset{\displaystyle COOCH_3}{\underset{|}{C}}\,(CH_3)\,-\,]\ n$$

The resulting polymer is called organic glass. It has high physical mechanical properties and resistance to atmospheric influences.

An in- tsiator (initiator) is added to the monomer to carry out the polymerization reaction. Benzoyl peroxide, isopropyl benzene hydro peroxide (hyperise), dinitrile of azoisomic acid, hydrogen peroxide are used as initiators [4].

Benzoyl peroxide was used in our studies.

Table 1
Effect of initiator concentration on the output amount of polymethylmethacratal polymer

Mixture №	Components, grams		Polymer content,%
	Methylethacrylate	benzoyl peroxide	
1	10	0,1	32
2	10	0,2	72
3	10	0,3	93
4	10	0,4	76
5	10	0,5	50

Initially, laboratory work was carried out to determine the optimal amount of initiator for the formation of polymethyl methacrylate polymer [4]. To do this, add 10 g of methyl methacrylate monomer to the solutions and add 0.1 to each; 0.2; 0.3;, 0.4; 0.4; and 0.5 g of benzoyl peroxide was added.

The tubes were placed in a water bath heated to a temperature of 800C and kept for 2 h. With the release of air bubbles from the mixture, the test tubes were removed from the bath and cooled to 500C and kept at this temperature for 2 h. Upon completion of the polymerization process, the amount of solid, transparent polymer formed in the solutions was measured (in% of the monomer mass).

The results from the experiments are presented in Table 1.

The data in the table and the curve shown in the figure indicate that the amount of initiator required to form the maximum amount of polymer is 0.3 g or 3%. Studies continued to study the strength of samples impregnated with methyl methacrylate monomer on old and new concrete joints.

SUGGESTIONS

The study was performed on horizontally molded prism-samples made of fine-grained concrete mixture with a content of 1: 3, S / Ts = 0.5, with a seam in the middle, horizontally molded. interruptions were taken at 6, 12, 24, 48, and 72 hours. 200g to soak into the joints of the samples. monomer 6g. a mixture prepared from the initiator was used. The soaking was carried out for 1 hour using special boxes made of tin and having the appropriate dimensions for the joints. To polymerize the absorbed monomer, the samples were placed in a container filled with water and heated to 800C and kept at this temperature for 2 h.

After this period, they were cooled to 500S and the bending strength limits were determined.

No results were obtained on testing the samples. This is because during the testing process, all samples were broken on the new concrete, not on the joint. Therefore, in order to evaluate the effect of polymer impregnation on the strength of the weld seam, two groups of non-weld seam samples were prepared. The first group was polymerized by impregnation with monomers of the composition described above. The samples in the second group were not impregnated with polymer.

Samples in both groups were tested for bending, and tensile strength limits were determined. Then, based on the test results, the effective coefficient of absorption was calculated as Ksh:

$$K_{sh}=\frac{R_n^1}{R_n^2} \qquad (1)$$

where R_n^1 is the elongation strength of the whole sample remaining after n hours of impregnation with the polymer, MPa;

R_n^2- elongation strength of a solid sample solidified in n hours, MPa

The value of the strength that can be achieved after the joint of old and new concrete is impregnated with the polymer was calculated according to the following formula:

$$R_{ch.} = K_{sh} \cdot \left(\frac{R_n^3}{R_n^4}\right) 100, \% \qquad (2)$$

where R_n^3 is the tensile strength of the specimens with contact welds, MPa;

R_n^4 - tensile strength of integral samples, MPa.

The results are given in Table 2.

Table 2
After the seam is impregnated with polymer consistency values

Indicators	Freezing time, days				
	6	12	24	48	72
K_{sh}	2,1	2,2	2,3	2,7	3,0
R_{ch} , %	176	147,4	128,8	124,2	120

The data given in the table and the curve shown in the figure show that the impregnation of the joints with monomers, their polymerization in the pores can increase the tensile strength of old and new concrete from 120 to 186% compared to solid concrete.The polymer impregnation effect was observed to decrease with increasing difference in the time of interruptions in the laying of old and new concrete. In fact, the shorter the breaks in laying new concrete on old concrete, the denser and stronger the joint will be.impregnation with monomers and polymerization in pores. This not only increases the density and strength, but also improves the properties of the weld, such as aggressive substances and cold resistance.

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