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TECHNOLOGY OF POLYMER-CEMENT MIXES PREPARATION WITH SPECIFIED RHEOLOGICAL PROPERTIES

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WITH SPECIFIED RHEOLOGICAL PROPERTIES

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Prethodno priopćenje

Sažetak: *U članku je razmatran i analiziran utjecaj komponenti za popravak kompozicije materijala (betona) u procesu eksploatacije na temelju reologije cementne tekuće smjese. Reološka svojstva, kao što su indeks efektivne viskoznosti i ocjena razine destrukcije pri posmičnom naprezanju razmatrana su ovom članku.*

Ključne riječi: *polivinil acetat, polimerski prah, smjese, reološka svojstva cementa*

Preliminary communication

Abstract: *Influence of components of repair compositions is in-process considered on the basis of cement astringent on rheology of their liquid phase. As a rheological properties, such indexes as effective viscosity and rate of destruction at shear deformation are considered.*

Key words: *mixtures, polymer powder, polyvinyl acetate, rheological properties of cement*

1. INTRODUCTION

In recent years, many new materials appeared on our construction market: polymer pastes, sealants, primers, foam. In addition, dry mixes have been suffered some changes. Previously, for the bonding of stones, leveling and processing of walls and ceilings - lime, clay, alabaster, gypsum, and mixtures were used. Before the use, they are diluted with water. The development of dry mixes conducted in order to increase joint strength of materials and ease of their application. Previously construction mixtures were made directly on the construction site, under such conditions recipe is rarely enforced, resulting the increase of components consumption. Nowdays, dry mixes are produced in factory conditions. They already contain all the necessary components in the correct proportions. Their preparation for applying is very easy: the right amount of water must be added.

Industrial production of dry mixes stepped forward when one started adding polyvinyl acetate glue or PVA. Humanity became acquainted with polymer-modified dry mixtures. The advantage of adding the polymer solution is obvious: during the solidification of the mix, glue forms flexible connections between solid particles. They compensate tensile load on itself. A similar function is in steel reinforcement in concrete. These special additives or compounds impart special properties of finished mix: increased bond strength of materials, elasticity, i.e. the ability to resist expansion and contraction with changes in temperature, moisture resistance, water resistance and resistance to mechanical stress.

Modification of building mixtures produced by cellulose ethers, redispersible powder and other additives, which significantly affects the physical and mechanical properties of the solutions. Additives can achieve such properties that ordinary mortars cannot demonstrate. Special rheological properties of such mixtures should be given as plaster, putty and tile adhesives. Important and high elasticity adhesive characteristics solidified thin slurries.

As a rule, construction mixtures obtained from the dry mortar, made up of many components with different rheology. Solids solution at external forces are acting not only on the working tool, but also on attractive and repulsive forces, which depend on the type and dosage of modifying additives, physical and chemical properties of cement and aggregates. Attractive forces are formed, for example, of van der Waals, electrostatic and capillary. These forces give rise to flocculation and agglomeration, which changes the pattern of viscosity, usually increasing it [1].

As it is known, dry mixes from the viewpoint of colloidal chemistry are dispersion systems. Dispersive systems with the ability to form a solid structure, physical properties occupy an intermediate position between the liquids and solids, approaching one way or another depending on the degree of development and the strength of the structural grid. The presence of structure gives dispersion unique mechanical properties. These characteristics - flexibility, strength, ductility, toughness

depends on the chemical nature of the materials constituting the system is determined by the molecular forces of adhesion between structural elements, their interaction with the dispersion medium and the degree of structure in the entire volume of the system.

2. EXPERIMENTAL STUDY

At the Odessa State Academy of Civil Engineering and Architecture were conducted a series of rheological studies of the liquid phase of dry mixes, which was the basis for us to make the following experiment.

In full-scale experiment, the effect of polymer additives on the rheological parameters of the liquid phase viscosity (η) and the rate of destruction of the structure (m) has been studied. The experiment was performed on the D-optimal 15-point-like plan B3. For liquid phase, saturated solution of calcium hydroxyl with addition of cement clinker were used in quantity of 20 pbw for 100 ml of liquid phase. Macromolecular ranged three ingredients: X1 - redispersible polymer powder dosing Vinnapas RI 554Z, which is a copolymer of vinyl chloride, ethylene and vinyl laurate from 4.5 to 8 pbw saturated solution of calcium hydroxyl; X2 - dosing superplasticizer Hostapur OSB - based on the high molecular surfactant olefin sulfonate, sodium salt, from 0.15 to 0.1 pbw saturated solution of calcium hydroxyl; X3 - dosing Tylose - methylhydroxyethylcellulose, are water-soluble, nonionic cellulose ethers, 0.8, and 1.25 pbw 2 saturated solution of calcium hydroxyl. Redispersible polymer powder Vinnapas RI 554Z and methyl hydroxyethyl cellulose are inputted to the mixture to improve water retention simultaneously with a high water-retention ability opens the possibility of improving the rheological properties of a cement slurry, which is important when applied to a vertical surface. An effective action on the cellulose ether and the phenomenon of sedimentation and improving of solutions workability by increasing the ductility of [4]. Inputting of Vinnapas resin improves the adhesion, tensile strength, flex, deformability, resistance to abrasion and their mass modified ease of application. Thus, it does not have a significant effect on the spreading thixotropy or water retention, allowing it to profitably be combined with mortar additive that is used to achieve particular technological properties. Hostapur OSB superplasticizer is inputted in a mixture of plaster and masonry as a blowing agent, a wetting agent and a plasticizer. Air pores formed by it are stable and reduce shrinkage significantly and associated cracking, especially for mixtures with cement-lime basis, another advantage of this powder is high frost resistance and decreased efflorescence of solutions [5].

Studies were conducted on the RPM rotational viscometer - 1M. This viscometer measures the viscosity in the range of 1,8 •10-3 to 3,75•104 Pa•s with a sensing element "cylinder - cylinder". Effective viscosity η, Pa•s measured in a wide range of velocity gradient $0.045 \leq \gamma' \leq 5.705$ c-1 (as when it increases, and in the opposite direction) to all fifteen compositions. In this range of shear rates viscosity curves are well described by the model of Ostwald - de Waele [6] $\eta = K \bullet (\ln \gamma')^m$. The coefficient K is equal to the effective viscosity η, Pa•s, at a shear rate $\gamma' = 1$ c-1, and the exponent $m < 0$ characterizes the rate of destruction of the structure under shear deformations - the higher the |m|, the less stable structure with fluid flow.

Based on the results obtained using the equation Ostwald - de Waele, incomplete cubic model (1-2) were built, the obtained models have been described field of rheological properties of the liquid phase - the effective viscosity (η) and the rate of destruction of the structure of the | m |, Fig. 1.

$$\eta = 5.584 + 0.176x_1 + 0x_1^2 \pm 0.166x_1x_2 \pm 0x_1x_3 \pm 0x_1x_2x_3 + 0.167x_2 \pm 0x_2^2 \pm 0x_2x_3 + 0.632x_3 \pm 0x_3^2 \quad (1)$$

$$|m| = 0.718 \pm 0x_1 - 0.033x_1^2 \pm 0.023x_1x_2 + 0.074x_1x_3 - 0.038x_1x_2x_3 + 0.0137x_2 \pm 0x_2^2 \pm 0x_2x_3 + 0.049x_3 + 0.08x_3^2 \quad (2)$$

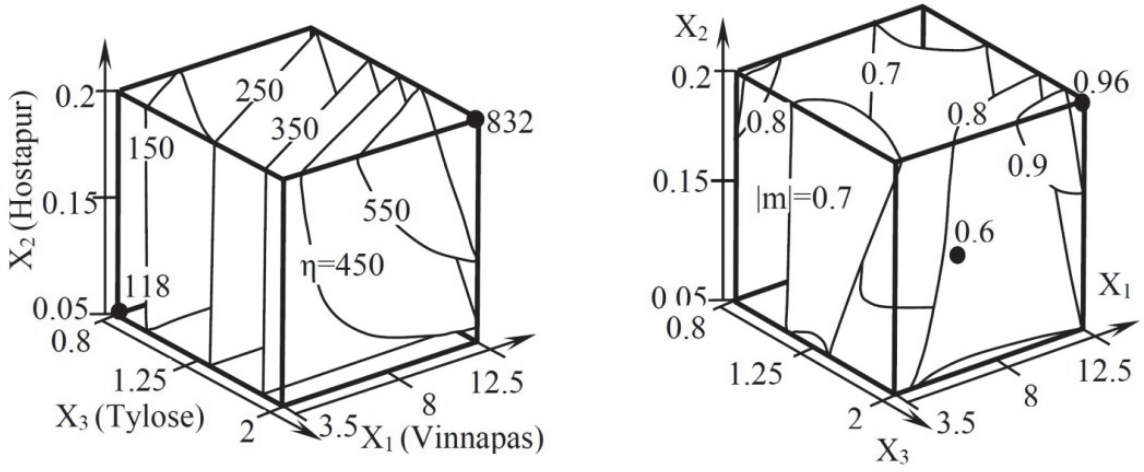

Figure 1 Models have been described field of rheological properties of the liquid phase

3. CONCLUSION

Because of researches and processed data, following conclusions can be made. Value equal to a minimum effective viscosity 118 Pa•s corresponds to the point where all three components of high molecular weight are in a minimum quantity, and with increasing addition of an effective amount of viscosity increase by 7 times, and high viscosity index equal to 832 Pa•s which corresponds to the number of all components the most. Relative to index | m | - the tempo of breakdown of the structure, it is possible to draw the following conclusions - the least impact on the index of | m | is made by Vinnapasa number, and if they contain all the ingredients at maximum, pace of destruction of the structure reaches its greatest exponent.

4. LITERATURE

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