Chemical sciences

UDC 543.54; 544.72

**PoluektovaV.A.**
candidate of Engineering Sciences,associateprofessor
Belgorod State Technological University named after V.G.
**StolyarovaZ.V.**
candidate of Economics, associateprofessor
Belgorod State Technological University named after V.G.
**LomachenkoS.M.**
researcher
**ChernikovR.O.**
studen
Belgorod State Technological University named after V.G.

# ADSORPTION OF DOMESTIC WASTES-BASED MODIFIER OF RESORCINOL ON THE SURFACE OF MINERAL PARTICLES

**Summary:** The results of researches of adsorption waste paperboards production of resorcinol on the surface of the particles of $CaCO_3$, $Al_2O_3$, $SiO_2$ are represented. Adsorption parameters of measured particle are calculated. The proposed mechanism of action of plastificated modifier are considered.

**Key words:** adsorption, adsorption parameters, mineral suspensions.

The Study of Belgorod superplastificator (SB-3) obtained by polycondensation of production wastes of resorcinol with formaldehyde, on the rheological properties of cement paste have shown that the use of this additive significantly reduces the maximum dynamic shearing stress and plastic viscosity of suspensions [1-3]. However, the adsorption studies on the boundary

of "solid-solution" properly with cement slurry application is not correct in connection with the ongoing processes of hydration. Therefore, as a model system are aqueous dispersions of chalk and crushed marble ($CaCO_3$), silica ($SiO_2$) and alumina ($Al_2O_3$), that does not interact with water and contains cations included in most of the clinker minerals.

In the source water suspensions on the long distances between the particles is dominated by the force of gravity. The secondary minimum conditions is thixotropic flow regime, i.e. the limit of the dynamic shear stress. The introduction of certain concentrations of the modifier results in reduction of plastic viscosity up to certain minimum values [4] and dynamic voltage shift virtually to zero, there is a Newtonian nature of the suspension. In such systems, there is the equality of forces of attraction and repulsion between particles. A further increase in the concentration of additive leads to the dilatant regime of flow system, which is characterized by the presence of "crowded" conditions and prevailing forces of repulsion. This can occur when the dispersity and stability of the system. The excess repulsion force is due mainly to the formation of layers of water adsorption-developed layers.

SB-3 adsorption isotherms on chalk, marble, silica and clay are the typical character of the diester of adsorption. When small equilibrium concentrations is observed almost complete extraction of adsorbate from the solution, with a further increase of concentration on saturation curve modifier and adsorption reaches its maximum value.

Calculation of the landing site for molecules of SB-3 has shown that it is about 2 $nm^2$/mole. For molecules of SB-3, consisting of an average of five monomeric units, landing stage of the monomer level 0,4 $nm^2$ is equal, that is close to those obtained for the model oligomeasured electrolytes as presented in the table 1.

Table 1

**Adsorption layer of monomolecular options**

| Dispersedphase | Ss., $m^2/kg$ | W/S | δ, nm | $G_{max}\cdot10^7$ $kg/m^2$ | Sm, % of the mass of the dispersed phase | | $S_o$, $nm^2$/mole |
|---|---|---|---|---|---|---|---|
| | | | | | calculation (ads.) | exp.(reol.) | |
| Marble | 1200 | 0,40 | 0,79 | 8,33 | 0,102 | 0,120 | 0,25 |
| Chalk | 2000 | 0,55 | 0,83 | 8,80 | 0,180 | 0,200 | 0,23 |
| Silica | 240 | 0,3 | 0,78 | 7,72 | 0,02 | 0,03 | 240 |
| Alumina | 379 | 0,63 | 0,78 | 7,85 | 0,03 | 0,05 | 379 |

The experiments on the hillshade of SB-3 from the surface of the chalk through a multiple change of solvent have shown that 80-90 % is bound irreversibly of the total number of adsorbed obtained. Calculating the dosage of additives, it is necessary for the formation of monomolecular layer $G_{max}$ and the corresponding equilibrium concentration [4]. The received values can be seen in the table.

As seen from the data, there has been a satisfactory match between dosage calculated according to adsorption and optimal dosage according to rheology [3,4]. This indicates that the maximum aggregate stability is completely filled with adsorption layer. The weak dependence of the adsorption parameters from the crystallized chemical structure indicates that adsorption of SB-3 on mineral surfaces significantly due to dispersion interaction. Thus the molecules are oriented parallel to the SB-3 on the surface, providing them with irreversible adsorption through a cooperative effect.

Anion oligomeasured additives, adsorbing on the surface of the dispersed phase, will increase the absolute value of the negative surface potential. On the other hand, to the extent of adsorption layer boundary slip will move further in depth solution that will reduce the absolute value of the building on the edge of

the slip. The dominant role of this factor is the relatively small quantities of adsorption layers not exceeding 1 nm from adsorption measurements.

Based on the data obtained, the proposed mechanism of action modifier plastificator SB-3 is as follows. Resorcinol formaldehyde molecule is adsorbed on the surface of the oligomers of dispersed particles, while the hydrophilic portion of the molecule is in the solution. And since the hydrophilic groups in the oligomeasured molecule are regularly going on hydrophillization of the surface and reduction of the molecular forces of attraction. A significant decrease in the force of interaction between dispersed particles leads to the destruction of the structure and a drastic change of the rheological parameters. Thixotropy, caused by the interaction of particles virtually disappears.

*Work is performed within the framework of the research project No. 14-41-08015 sponsored by RUSSIAN FOUNDATION for BASIC RESEARCH and the Government of Belgorod region.*

**Literature:**

1. Lomachenko V.A. Superplasticizer for concrete SB-3. Physical chemistry of building materials. Belgorod: 1983.p.6-12.
2. Lomatschenko V.A., Yashurkaeva L.I., Yashurkaev O.V. Study of the adsorption and the rheological properties of raw materials with the addition of SB-3 // The successes of modern natural science. 2008. №9. p. 123-124.
3. Lomachenko D.V., Lomachenko S.M. Study of adsorption of SB-3 on the surface of the $CacO_3$//Advanced innovations in science, education, production and transport 2012: Internet Scientific Conference Ukraine: SWorld, 18-27 Dec. 2012 [internet source].
4. V.A. Poluektova, V.A. Lomachenko, Z.V. Stolyarova, S.M. Lomachenko, V.M.Malinovker . Colloid-chemical properties of water

dispersions of chalk and marble//Fundamental reseaches. No. 9  2014 (part 6). p. 1205-1209.