INVESTIGATION OF THE PROPERTIES OF A COATING BASED ON AN ACRYLIC MONOMER

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Abstract. *In the practical experiments of this research work, various additives and fillers added to increase the heat resistance of the acrylic-styrene composition coating. In order to study the thermal stability of the obtained sample, as well as to draw the appropriate conclusion, the derivatographic and thermomechanical parameters of the coating sample were obtained and analyzed in special measuring instruments. According to the results of the analysis, it found that the resistance indicators of the acrylic - styrene coating sample obtained in practical experiments are positive.*

Keywords: *derivatographic indicators, acrylic emulsion, heat-resistant coating, thermomechanical analysis.*

Introduction. In recent years, there has been a tendency to increase the production of products based on acrylic monomers and the volume of their consumption by 5-10 % per year. In particular, the volume of production of products containing acrylic in 2015 amounted to 6 million tons, while by 2021 it will amount to 7.65 million tons. According to industry experts, by 2026 this figure will reach 10 million tons, 16 % of the acrylic-based products currently produced correspond to the contribution of coatings obtained in the presence of monomers such as styrene, urethane, and vinyl.

Increasing the heat resistance of such products due to a removable acrylic-based coating was consider one of the urgent tasks, and important research is currently being conduct in this area. In this research work, the appropriate additives and fillers were included in the composition of the acrylic styrene coating, the heat resistance of which studied in practical experiments.

Methods and materials. To obtain an acrylic-styrene paint composition with heat-resistant, coating properties, a 250 ml three-neck flask equipped with a mechanical mixer, a reverse cooler and a thermometer obtained in laboratory conditions. The flask heated to a temperature of 70-80 ° C in the state of acrylic emulsion, adding the appropriate amount of additives and fillers. The mixing speed is 3500 rpm for an hour until a dark-looking coating is form mixed at high speed.

In order to study the thermal properties of the resulting acrylic-styrene coating, derivatives and thermomechanical parameters analyzed [1-2].

Results and discussion. In the course of the study, the derivographic indicators analyzed in order to study the thermal nature of the acrylic-styrene coating formed in the presence of appropriate additives and fillers. According to the results, the DTA curve of the exothermic effect of this acrylic-styrene coating detected at temperatures of 240 and 357 °C, as well as the endothermic effect at temperatures of 30, 206 and 557 °C (fig.1).

It found that the sample of acrylic-styrene coating, presented in accordance with the above drawing, is in the temperature range of 30-801°C when studying the viscosity of mass loss under

temperature exposure. At the same time, in the temperature range 206-557ºC, the maximum mass loss of the sample is 31%, and the minimum mass loss is 4.7%, manifested in the temperature range 557-801ºC. In turn, when the temperature exceeds 801oC, 59% of the sample remains intact. These stages of the process accompanied by an exothermic effect [3].

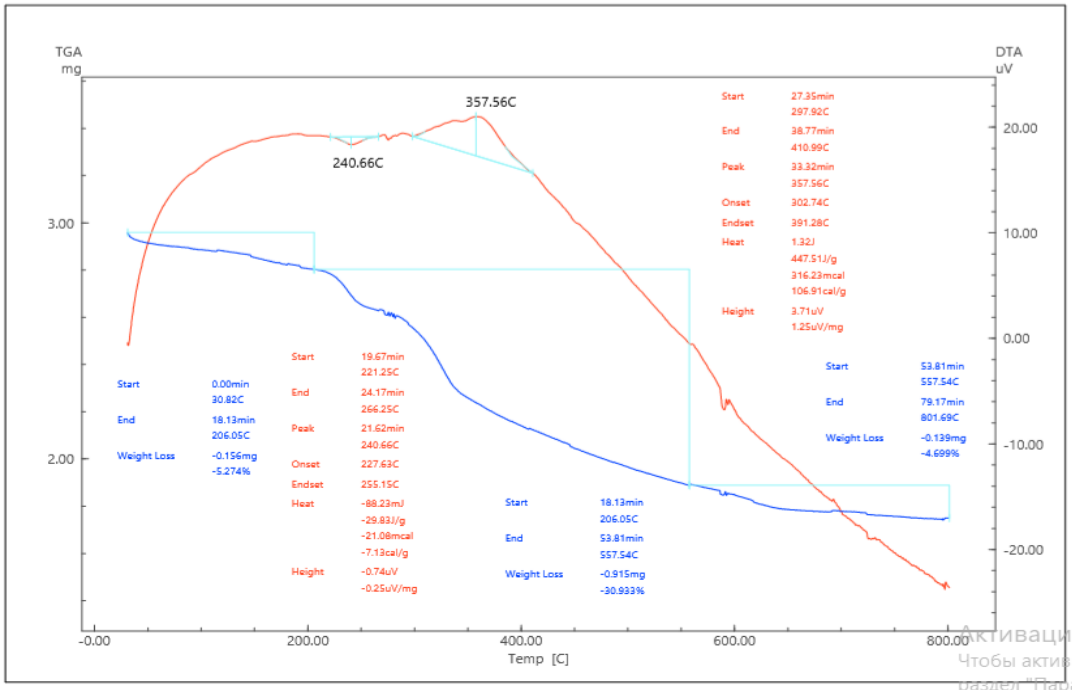

Figure 1. Derivatographic indicators of acrylic-styrene coating.

Based on the results obtained by the methods of analysis of DTA and TGA derivatives of the sample, kinetic parameters for various temperature intervals of the process were determined. Its advantage determined by a number of measurements and calculation of kinetic properties over the entire temperature range of reactions from a single sample. In particular, it found that 41% of the total mass up to a temperature of 801ºC of the sample from the acrylic-styrene coating composition subjected to thermal decomposition, and the analysis of the thermal decomposition of the acrylic-styrene coating composition obtained during the study was found positive.

In addition, the thermomechanical method used in the study of the thermal properties of the acrylic-styrene coating composition obtained during practical experiments. In accordance with this method, a certain unchanged bulk mass was applied to the surface of the sample. Based on the norms established in this case (ISO 11359), the temperature was increased in parallel with the constant force exerted on the surface [4-5].

The surface of the sample taken for this experiment and the strength calculation given to the sample were determined using the appropriate formulas. To study the thermomechanical nature of the sample obtained for the experiment, a control experimental work was carried out on the fact that its surface is 132 mk*m^2, the sample is under a constant force of 25 N, and in the range from 1°C to 460°C temperature using a special device.

According to the results of the experiment, it observed that the thermomechanical curve of the sample deformed without permanent changes up to 20ºC of damage. Softening inversion of the sample deformation observed in the temperature range from 20 to 400°C. When the temperature increase continued, the transition of the sample to a highly elastic state at a temperature of 400°C was observed.

During the procedure, when the temperature increased from 401 to 460°C, a constant deformation of the sample observed. The intervals of temperature change and deformation during the experiments shown in the figure below (fig. 2).

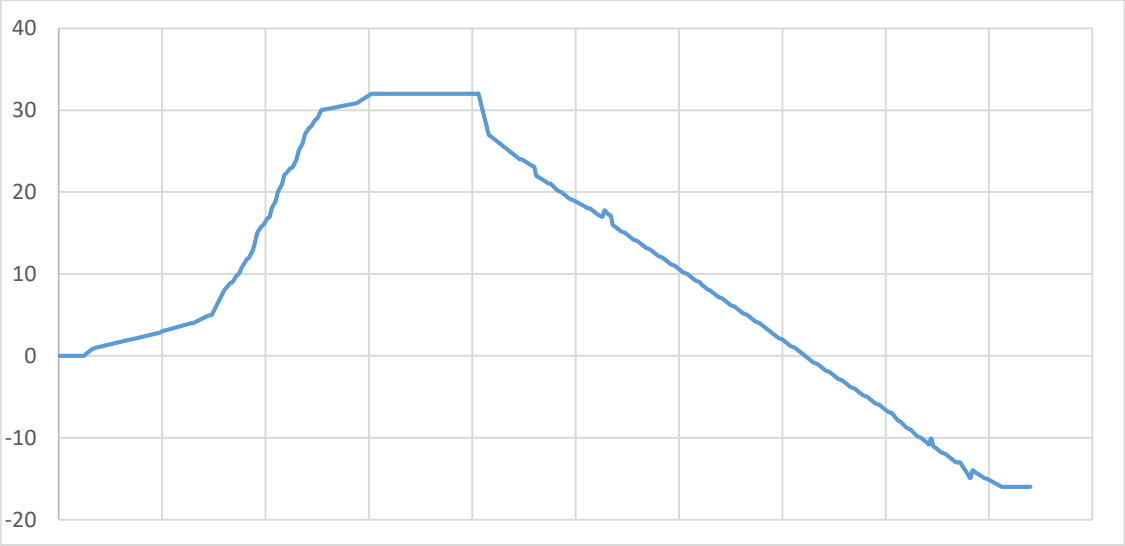

Figure 2. Thermomechanical curve of acrylic-styrene coating.

At the same time, during the experiment, when exposed to a sample with a force of 25 N, in accordance with the above calculations according to the formula, a constant pressure of 0.188 m n / m^2 arises with an increase in temperature [6].

In this process, the deformation of the sample in the temperature ranges from 1°C to 50°C in the case when the pressure and force remain unchanged is from 0 mm to 18 mm as long as no change has been observed. In addition, deformation at temperatures up to 50-100°C was 18 mm – 53 mm, in the range from 100-150°C to 53-60 mm, the deformation of the sample at 400-460°C was 451-510 mm. When the temperature given to the obtained samples reached 460°C, the highest state of deformation of 510 mm observed without changing the inversion index.

Thus, appropriate additives and amulets were added to further increase the heat resistance of the acrylic-styrene coating obtained during practical experiments. The results of the thermostable and thermomechanical plasticity of the obtained coating sample found to be positive in comparison with their analogues in the analysis.

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