Physico-Chemical nanomaterials science

Metal-containing polymers based on heat-resistant aromatic polyamide phenylone

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The work is devoted to the development of new thermo-resistant metal-containing polymers based on aromatic polyamide phenylone for friction units instead of highly deficient metals and known antifriction materials.

It has been established that physical and chemical interactions between metal particles and phenylone significantly affect the processes of structuring of the developed metal-containing polymers. Physical interaction is manifested in an increase in the average size of crystallites with a simultaneous decrease in the shortest interatomic distance, which has been revealed by quantitative X-ray analysis. The appearance of new structures at the polymer-filler interface, which is not characteristic of the polymer matrix, has also been confirmed by electron microscopy. Chemical interaction has been established using IR spectroscopy: metals affect the intermolecular bonds of both amide groups and amino groups of phenylone by eliminating deformation vibrations of (N-H) amide and amino groups.

The effectiveness of the impact of the nature and content of metals on thermophysical, physico-mechanical and tribological (introduction of Ni improves phenylone wear during dry friction by 11 times, and Br by 26 times during friction with lubricant) properties of metal-containing polymers has been shown.

According to the results of bench tests of details from metal-containing polymers, the expediency of carrying out pilot-industrial tests of the auger eyelets of the header of combine harvesters (according to bench tests, metal-containing polymers outperform the known analogues by 2…4.4 times in terms of wear resistance) and metal-containing polymers sliding bearings of rolling mills (metal-containing polymers filled with Br exceeds the wear resistance of bronze BrO5Ts5S5 by 35 times, that of textolite PTC by 9 times) has been proved.

Production tests have confirmed the efficiency and feasibility of using the developed metal-containing polymers as pivot sleeves in passenger electric transport (increasing durability by 6...7 times) and supporting rollers and rolling bearings of chain conveyors in agricultural equipment (increase in durability by 7 times).