Fire-retardant and weatherproof properties of nitrogen–phosphorus-containing suspensions based on dolomite and tripoli

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Fire-retardant phosphate suspensions (FRS) for wood and peat with the use of local natural mineral raw materials were developed [1]. The conditions of FRS synthesis were optimized in order to reduce the FRS cost with providing their effectiveness at the level of well-known fire-retarding agents. Acid and alkaline decomposition methods of aluminosilicate (tripoli) and calciferous-magnesium (dolomite) natural minerals with further neutralization of the reaction mixture by alkaline and acidic agents were used in the synthesis.

Studies of flame retardant, fire extinguishing properties and running ability (aggregate stability, weatherability) of synthesized suspensions were carried out. Then, the obtained data were compared with those of well-known specialized FRS. So, it was found that the flame retardant properties and storage stability of tripoli-containing suspensions increase, if a natural mineral decomposition was carried out in an alkaline solution. In the case of dolomite-containing suspensions, in contrast with tripoli-containing sistems, maximum fire-resistant, fire-extinguishing efficiency to wood and peat and aggregate stability was observed for FRS synthesized by acid decomposition of the mineral.

It was found experimentally that the nature of the mineral and the amount of HCl used during the synthesis has an effect on aggregate stability of suspensions. So, P_2O_5: HCl molar ratio should be at least 1–1.3 for suspensions with dolomite, and more than 1.7 for tripoli-containing FRS.

The dependence of suspensions' weatherability (ability of FRS to keep fire tests after water treatment of flame-retarded wood) on the content of dispersed components and the degree of their dispersion was revealed. Thus, maximum weatherability was shown for suspensions in which content of the dispersed components was not less than 30 %. 70–80 % of the particles were smaller than 5 μm when 30–37 % of them were smaller than 2 μm. It has been suggested that the fine-dispersed component of FRS provides deep penetration of fire retardants into the surface layer of wood, that allows them keeping steadilly on the surface without their washing away under moisture impact. These factors have to be considered in the synthesis of weatherproof FRS.

References

1. V.V. Bogdanova, O.I. Kobets *Izvestiya Sp. Fed. U. Engineering Sciences*. (2013). 9: 232.