

The effective fire protection of nonwoven polyether material

O. V. Reva, V. V. Bogdanova, T. N. Andreeva, A. N. Nazarovich, A. S. Luk`yanov
Belarus Republic Ministry of Emergencies State Educational Establishment Institute for Command Engineers, Minsk, Belarus, e-mail: volha107@rambler.ru

Permanent fireproof processing of the non-woven polyester materials is a very difficult task, because their fibers are chemically inert and have a very smooth surface with nonporous microstructure (Fig. *a*). Commonly, two and trivalent metals-ammonium phosphates used as non-toxic inorganic flame retardants are fixed on the polyester materials surface in the insufficient quantity even in case of the use of stannous-containing mediator agents applied for a chemical binding of the burning inhibitors to a polymeric matrix [1, 2]. Thus, deterioration of the exploitation properties of the fire protected polyester materials is observed mostly due to the growth of their hardness. It was assumed that the replacement of inorganic burning inhibitors by nitrogen and phosphorous-containing organic products containing reactive functional groups can provide an increase in the resistance of fireproof effect to washings of the polyester materials and the elimination of their hardening. One of the effective fire protectors for polyolefin polymers could be 5-aminotetrazol phosphate, containing reactive amino groups [3].

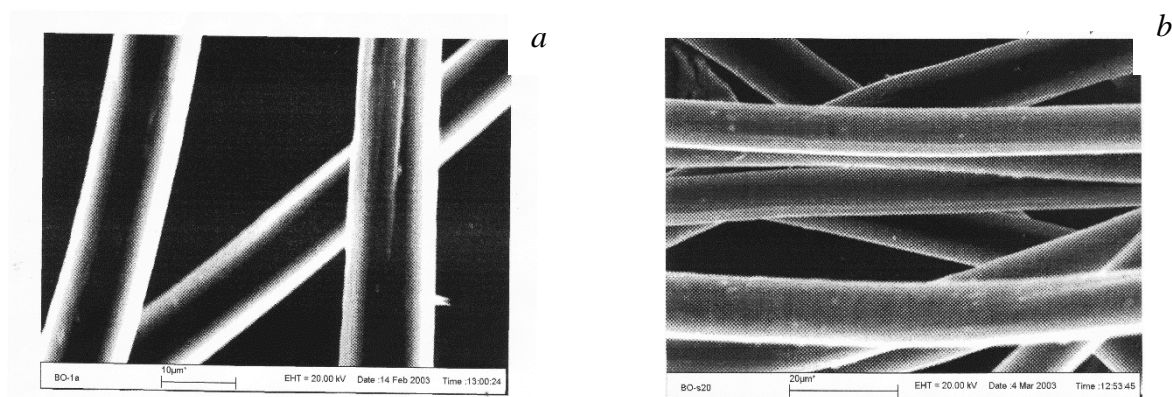


Fig. The surface morphology of initial (*a*) and fire protected (*b*) polyester fibers

In this work the nonwoven polyester fabric previously etched in alkaline solution was treated with 5-aminotetrazol phosphate alcohol solution. The fire protected material had satisfactory physical-mechanical properties such as softness, flexibility, elasticity. It was revealed that ~25–30 mass. % of the burning inhibitor was preserved on the surface of the protected fiber after washing of polyester fabric that was confirmed by electron microscopic researches (Fig. *e b*). For comparison, the fiber treated with inorganic burning inhibitors lost them in the result of the material washing.

By fire tests it was shown that the rate of the burning of the washed fire protected polyester material appeared to be 2–3 times under this rate in case of the initial sample. The results make it possible to conclude that the processing of polyester fabric with 5-aminotetrazol phosphate alcohol solution provides permanent fireproof effect.

References

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