

## New foaming agents for extinguishing of oil and gas products.

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Up-to-date capacities of production and consumption of oil products and gas condensate, increase in unit power for their storage and treatment make keen demands for extinguishing measures.

Abroad, first of all in the USA, effective foaming agents (FA) based on organofluorine acids of "Light water" type have been developed. A number of scientific research organizations in our country, including RSC "Applied Chemistry" and its Perm Branch together with the Russian Scientific Research Institute of Fire Fighting (RSRIFF) of the Ministry of Internal Affairs (MIA) of the Russian Federation (RF) have developed similar foaming agents using their source of raw materials on the basis of original compoundings and technological processes such as "Film formation" agent, "Foretol", "Universal" and "Podsloiny". The basic physicochemical properties and fire-prevention characteristics of these FA are given in the Table.

**Table**

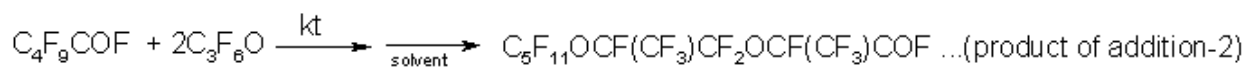
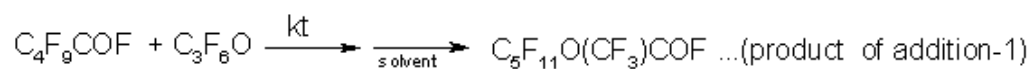
Foaming agent	Concentration of aqueous solution, %	Surface tension, Nm/m	Foaming multiplicity factor	Foam stability, min	Complete extinguishing time, sec	Developer
1. Light water	0.4-0.6	17.5	6-8	4-5	150	3M, US
2. Universal	0.6	17.0-18.0	6.5	5-6	96	RSC"AC"
3. Foretol	0.36	22.0max	10.0min	-	-	RSC"AC"
4. Podsloiny	0.5	18.0max	6.0-7.0	6-7	112	PB of RSC"AC"

But according to current information, the production of domestic FA has been completely stopped. In this connection an estimate of opportunities of enterprises to arrange production of FA to satisfy the requirements of extinguishing oil and gas products is of interest.

Perm Branch of RSC AC possesses production technologies for both conventional organofluorine starting products for FA (perfluoropelargonic acid and perfluoroenanthic acid) and novel type of raw material: products of addition of hexafluoropropylene oxide to fluoroanhydride of perfluorovaleric acid (PFVA FA). It should be noted that PFVA FA could

be produced by electrochemical fluorination of wastes from production of telomer alcohols that in its turn leads to the cost reduction of foaming agents.

The synthesis of the mentioned FA is carried out according to the scheme:



Scientific research and experimental works have shown that organofluorine components based on these compounds allow to produce effective extinguishing substances. That has been confirmed by investigations of RRSIFF MIA RF. It should be noted that such characteristics of novel foaming agents as the surface tension on the interface of water-air (180Nm/m), foaming multiplicity factor (6.5-7.0) and foam stability (6-7 minutes) are on the level of foaming agent "Podsloiny" passed a large-scale testing.

Thus, Perm Branch of RSC AC possesses the real scientific, technical and production ground to produce fire-extinguishing substances based on traditional and novel organofluorine components.