Development of new fire-fighting measures.

New technology to produce 1,1,1,2,3,3,3-heptafluoropropane and fields of its applications

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To implement the decisions of the Montreal Protocol to phase-out production of ozone-depleting substances, leading chemical companies of the world are developing technologies to produce ozone-safety chladones. One of them is 1,1,1,2,3,3,3-heptafluoropropane (R-227).

The main method to produce R-227 is addition of hydrogen fluoride to hexafluoropropylene.

The addition of nucleophilic reagents to fluoroolefins has been widely investigated. Due to a great electronic depletion of p-bond in fluoroolefins, electrophilic reagents are more difficult to add and it is possible to carry out these reactions only at elevated temperature using the following catalysts: derivatives of chromium and vanadium [1], chromium oxyfluoride [2], weakly alkaline ion-exchange resins containing tertiary amino groups [3], antimony catalyst [4], pentafluorides of niobium and tantalum [5], silver fluoride [6] and copper sulfate applied on activated carbon [7].

But the existing methods do not provide high enough yield of fluoroalkanes and complete conversion of starting fluoroolefin.

Therefore it was of interest to make a search of effective and available catalysts for hydrofluorination. As a result of efforts of Perm branch of RSC " Applied Chemistry", a universal technology to produce R-227, R-125 etc. has been developed and implemented at a pilot- industrial plant. The technology is based on the reaction of fluoroolefins hydrofluorination in the presence of catalysts, activated carbon promoted with inorganic fluorides.

The new technology allows to attain complete conversion of starting fluoroolefin, to produce R-227 in 96.0-98.0% yield and with the main content of 99.6% (grade A) and 99%(grade B).

At present experts evaluate R-227 as the most effective gaseous fire-extinguishing substance after the phase out of production of R-13B1 and R-114B2.

R-227 produced by Perm branch of RSC " Applied Chemistry" has found the widest application in fire-fighting installations to protect electronic and electrotechnical equipment, particularly server and computer rooms, Diesel-generator rooms, also in structure of extinguishing measures for library archives, museum exhibits and other treasures.

A comparatively high extinguishing effectiveness of R-227 at low toxicity in cold state allows to use it in installations of gas extinguishing protecting premises containing a big number of people because in case of a false actuation of the installation, a toxic effect on people indoors is almost excluded.

An obvious advantage of R-227 in comparison with others is its efficiency, since the use of R-227 requires much fewer modules of gas extinguishing. For example, to protect a room of 160m^3 capacity with electronic equipment it is required only one module MGP -50-100 with R-227 or two modules with R-125 or R-318 and three modules with CO_2. Thus the cost of protecting of 1 m^3 is reduced.

References

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