FLUORINE CONTAINING POLYMER MATERIALS BASED ON UNSATURAT ACIDS MODIFIED ACCORDING TO ESTER FRAGMENT AND THEIR PRACTICAL APPLICATION

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Here we discuss the approach to the fluorine modification of acrylates and maleates e fragment using partly fluorinated alcohols and acrylic, methacrylic and maleic acids' derivative synthesize them. We also discuss the reactions involving multiply bond and carboxylic grou maleic acid fluorine containing mono-ester and acrylic acid esters. We analyze acryl polymerization processes their co-polymerization with other olefines, and also fluorine contai polymers' characteristics. We also take a look at practical application fields of such poly materials.

Contents

4. Polymerization and Co-polymerization of Fluorine Containing Acrylates.

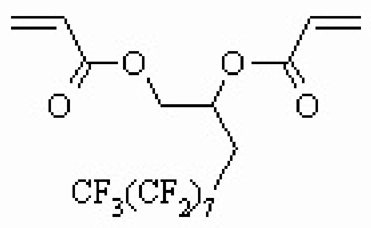
The polymerization of fluorine containing acrylates is going under radical initiators acting in water acetone solutions, as a rule in the majority of cases 2,2'- azo-bis-izobutyroniltrile (AIBN). In the works [115- the polymerization of 2,2,3,3,3-pentafluoropropyl-α–fluoroacrylate and 2,2,3,3-tetrafluoropropyl-α–acrylate u the influence of 2,2'-azo-bis-(2-methylpropionamidine)dichloride at rather low temperature of 60-70 °

described. Dodecylmercaptan is used as additive during the polymerization. In the work [119] the polymerization of perfluoroctylethylacrylate and methylacrylate in the presence of 2,2'-azob methylpropionamidine)dichloride (1-dodecanemercaptan, 160 ^oC, 1 min, after that at room temperature hours) [118] or the one involving stearylacrylate in the presence of azo-bis-iso-butyramidine hydrochlorid laurylmercaptan, 60^oC, 3 h) [119] were studied. The polymerization of perfluoroctylethylmethacrylate passe same way [120]. In these cases the yield of polymers is rather high and amounts to about 8(Perfluoroctylethylmethacrylate and perfluoroctylethylacrylate polyacrylate is obtained out of correspor monomers by 2,2-azobis-(2-amidinopropane)dihydrochloride (V-50) initiator action in the presence of bro octadecyltrimethylammonium [121], and it is also obtained during the reaction $CH_2=CHOC(O)CH_2CH_2(CF_2)_nCF_3$ (n = 5-11) acrylate and aceto-oxy-methylmethacrylate by az isobutylamidine dihydrochloride action in the presence of dodecylmercaptan and $C_{16}H_{33}NMe_3Cl$ at 60 ^oC ([122].

Liquid-phase process carrying out is also used in the gamma radiation field. For example, in the work [the influence of fluorine atoms introduction into acrylates ester fragment in studied for the resu polymerization (the process was hold at 313 K, the ^{60}(γ -radiation). Kinetics of fluorine conta methacrylates polymerization is described quite well by kinetic scheme containing quadratic brea progressing macromolecules and clearly defined gel-effect. Kinectics drastically differs from hydrocarbo methacrylates polymerization by absence of quasistationary conditions. Authors suppose, that at the beginning of fluorine containing acrylates polymerization the strong branching of structures takes place, leads to special isolation of growing macrocycles. The consequence of this is that there is no quasistatio stage of polymerization. Polymers based on fluorine containing acrylates are characterized by high elasticity are closing raw rubber by their characteristics, while the polymers of fluorine containing methacrylates fragile. It can be used to obtain polymer materials with new interesting characteristics.

Co-polymerization of fluorine containing acrylates and unsaturated compounds is one of the approach characteristics modified polymer materials synthesis. Mainly, the co-polymerization is hold invo hydrocarboxylic acrylates and methacrylates and some of their derivatives in the presence of tetralkylammo bromide radical initiators (for example, octadecyltrimethylammonium bromide [121], laurylsulphate sodium in the aqueous ammonia medium [124] , $C_{16}H_{33}NMe_3Cl$ [122], tatrabutylammonium bror cetyltrimethylammonium bromide, dodecyltrichlorammonium chlo $\{C_{22}H_{45}N[(CH_2CH_2O)_{15}H]_2[CH_2C_6H_5]\}^+ . Cl^-$ [119]).

Co-polymerization of hexafluoroisopropyl-α-trimethylacrylate and isobutyl vinyl ether goes effectively unde action of *tert*-butylperoxipivalate [125].Co-polymerization of polyfluoroalkylacrylates $CH_2=CHC(O)OCH_2CH_2(CF_2CF_2)_nCF_2CHF_2$ (n = 3,4,5) and butyl- or metylacrylate in the presence of A [126-128] or system CuBr/CuBr2/1,10-phenanthroline/ ethyl-2-bromoisobutyrate [129] goes effectively $CH_2=CHC(O)OCH_2CH_2(CF_2)_nCF_3$ (n = 5-11) acrylate co-polymerizes with methylmethacrylate hydroxiethylmethacrylate [65,66,130] or styrene [131] in presence of $(NH_4)_2S_2O_8$ and laurylmercaptane [This co-polymerization goes under the action of AIBN in the presence of dodecanthiol [118,132] in aceto under the influence of AIBN [131], and co-polymerization of $CH_2=CHOC(O)CH(CH_2Cl)(CF_2)_nF$ (n = 6, acrylate and N-methylolacrylamide passes under the influence of $K_2S_2O_8$ - $NaHSO_3$ [90]. Co-polymerizati $CF_3CF_2(CF_2)_nCH_2CH_2OC(O)CH=CH_2$ (n = 2,4,6,8,10,12) with methacrylate polyethyleneoxide dialkylaminoethylmethacrylate passes under the action of acetic acid peroxide at 60 ^oC [133], the polymerization of the first mentioned compound and stearylmethacrylate and 2-hydroxiethylmethacrylate pa at 65 ^oC [124], it also passes together with acrylates and silicon drivatives [134], and aminorganylpolysiloxanes [135], with cyanoethylcellulose [136]. *1H,1H,9H*-hexadecafluorononyl methacr and methacryloxypropyltrimethylsilane produce polymer, which is used to obtain coatings for textiles and [137]. The co-polymerization of $CH_2=CHC(O)O(CH_2)_{11}(CF_2)_7CF_3$ and 2-hydroxyethylmethacrylate in presence of dibutylphtalate produces polymer product[138], and co-polymerization $CF_3CF_2(CF_2CF_2)_nCH_2CH_2OC(O)CMe=CH_2$ (n = 6,7,8) and $CH_2=CHC(O)O(CH_2CH_2O)_mH$ (m = 3 produces fluorine containing polymer [139,140], used for textile treatment. Polymerization of CH_2=CHO $(CH_2CH_2)_nR$ (R = *1H,1H*-dihydroperfluoroctyl , n = 0-3) is initiated by sodium metabisulphite and ammo persulphate at 60 ^oC [141], and polymerization of *1H,1H,5H*-octafluoropentylacrylate in dimethylformami initiated by hydrogen peroxide at 60 ^oC (6 h) [142]. Acrylates like $CY^1Y^2=CXOC(O)QR_F$ (R_F = C1 polyfluoroalkyl; Q = bivalent organic group; X = H, F, CF_3; Y1,Y2 = H, F) are polymerize $(C_5Me_5)_2Sm(III)Me(THF)$ [143], and *1H,1H,5H*-trihydroctafluoropentylacrylate is polymerized in dimethylformamide medium at 80 ^oC (6 h) by hydrogen peroxide [142]. Co-polymerizatio dimethylhydrosiloxane and **A** acrylate at 80 ^oC (6 h) in the presence of hydrosilylation catalyst resultsin for of polymer product used to obtain glass coatings [144].



A

We should remember, that in most cases such polymer materials consist of many components, the intera character of components between each other and polymer matrix is studied not well enough. That's unexpected effects can appear. For example, the quality of coating can increase because of synergism or o contrary, it can decrease because of strong catalyzing action of one of mixture's components. Finding wa increase adhesive characteristics of fluoroorganic polymer coatings is one of the most important practical of synthetic chemists. Here we should take into account economic factors. Thus, *1H* dihydroperfluoroalkylethylacrylates compare to *1H,1ω,H*-trihydroperfluoroacrylates are more expensive and available, at that in a number of cases properties of their polymer are close to each other, that was used to some practical goals. Lately co-polymers of these two groups of compounds are used bringing the mixture s of more expensive component to 30-35 % [145].

The properties modification opportunities of fluorine containing polymer materials with their u characteristics in case of wide application can lead to noticeable progress in many fields of techniques medicine.

5. Practical Application Fields of Fluorine Containing Polymer Materials Based on Fluorin Acrylates and Maleate

One of the main practical application directions of fluorine containing polymer materials based on flu modified ether part of acrylates and methacrylates molecules like CH_2=CRO(O)$(CH_2)_n(CF_2)_m$A (R = H, Me 1,2; m = 1-10; A = F, $CF(CF_3)_2$) and CH_2=CRO(O)$CH_2(CF_2CF_2)_n$H (R = H, Me; n = 2,4,6,8,10,12) is crea of chemicals, which use for treatment of fiber surface makes them high hydro-and oleophobic, that incre water-and oil-repellent properties and creates protective surfaces based on different compounds. Thus compositions are used for treatment of cotton [118,121,146,147], silk [127], cellulose [139,148], synthetic f (nylon [122,149], viscose [141,150], polyester [151-153]) to add water- and oil-repellent properties to fabrics to provide them with complex of high consumer characteristics. The fabrics chemical treatment doesn't dec the resistibility of fiber dyeing, the dirt gotten on to fiber can easily be deleted during washing, such treat also forwards the improvement of textile articles stability of shape, especially wrinkle resistance. They are for production of low humidity glass fiber [145].

Fluorine containing co-polymers in combination with other addition agents found their applicatio cosmetics production (skin moisturizers and tonics) [126,128,152-158] and they are also used for producti biomedical vessels and prosthesis including implantants [159]. High fluorinated organic compounds usually dissolve molecular oxygen. This particular feature increases quality of cosmetics.

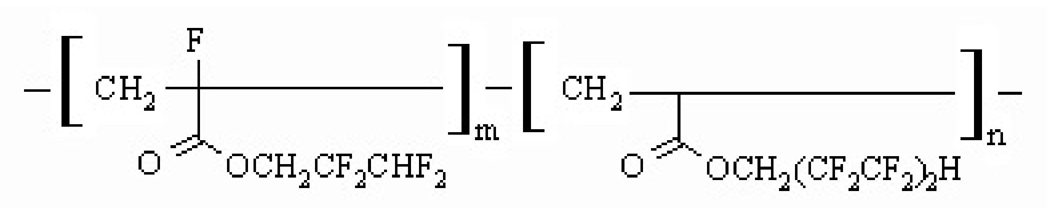
Co-polymers based on *1H,1H*-dihydroperfluoroalkylacrylates andoctadecylacrylate were used to crea double coating of polyethylene film, that made it having fog characteristics [160]. Fluorosilicone poly obtained using perfluoroalkylacrylates were used to modify surface and characteristics of polyvinylchloride widely used for agriculture [161]. Free surface energy of fluoro-silicone co-polymer amounted to 8-10 di when molecular mass average value is 3000-7000, and this amount was 15-40 din/cm for double vinylchloride film depending on concentration of used co-polymer.

Co-polymers based on perfluoroctylacrylate and 3-(perfluoroctyl)propan-1,3-diol were used for membr coating, which distinguished by high water-oil-repellency and firmness [162]. Co-polymer of *1H,1H,2H* heptadecafluorodecylethyl acrylate and dimethylsiloxanediol applied on membrane, made of poly(methacry and poly(dimethylsiloxane) created filtering base for separating water from benzene (benzene concentration within the range from 0.05 to 70 %) [163]. Here important feature introduced by perfluoroalkyl group is i polymer's gas impermeability increase. Co-polymerization of *1H,1H*-dihydroperfluorobutyl- and *1H* dihydroperfluoropropylperfluoromethoxyacrylates and unsaturated compounds, for example butad produces products with significantly increased ability to swell in solvents [164], the lengthening of carbo chain conversely decreases this feature of polymer products.

Polymer based on fluorine containing acrylate $(C_nF_{2n+1})(CH_2)_x$CHROC(O)CH=CH_2 (n = 6, 8, 10; x = 0 = H, CH_2OC(O)CH=CH_2) produces film on the surface of membrane made of polytetrafluoroethylene, w posseses high water- and oil-repellent characteristics [165].

Poly(perfluoroctylethylacrylate) was applied in the composition to produce artificial marble with long la water-repellent characteristics [166], and co-polymer of *1H,1H,2H,2H*-heptadecafluorodecyl acrylate *1H,1H,5H*-octafluoropentyl acrylate with dimethylaminoethylmethacrylate was applied in the compositic mixture for glass coating, possessing antipolluting and antifog characteristics [167].

$H(CF_2CF_2)_nCH_2O$ fragment in the polymer composition arouses changing of its few characteristics. T modified poly(methylacrylate) especially co-polymer of *1H,1H,3H*-trihydrotetrafluoropropyl-2-fluoroacr with *1H,1H,5H*-trihydroctafluoroamylacrylate possesses characteristics of polymer optical fiber [7].



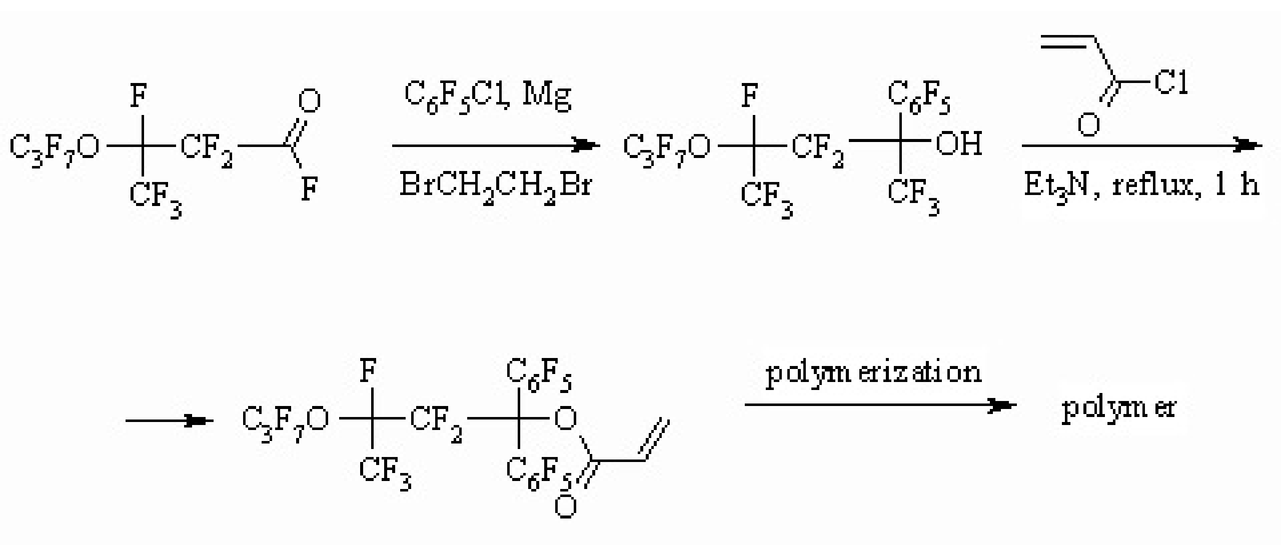
Refraction index of polymer optical fiber is rather low (n^{20}_D =1,4), flow index of melt for applying a li reflecting covering is 10-30 g /10 min at 190 ^oC. They are well adhesion to the nucleus of this co-polymer, also their elasticity is high. This allows to obtain optical fiber of 2 mm diameter, standing strong flexure.

Polymers of α-fluoroacrylates exceed a lot in terms of many operational characteristics their methac analogues. Introduction of fluorine into ester part of polymer resulted in improving of block organic characteristics and first of all it had an effect on thermal endurance and impact resistance (Table). Exce optical properties of such fluorine modified polymers coupled with high thermal endurance, flexibility and w resistance allows to use them in fiber optics. Refraction index of such polymers equal to 1.36 - 1.50 allows to them as materials of optical fiber nucleus and light-reflecting covering [168-176]. They can be require materials for optical storage of optical disks [171,177].

Table. Some of Fluorine Containing Acrylates Characteri

CH_2=CYCOOR		k_n , % optical transmission	n^{20}_D	a_n , KJ/m^2 impact elasticity
Y	R			
F	$CH_2CF_2CF_2H$	91	1,398	95
	$CH_2(CF_2CF_2)_2H$	90	1,379	77
	$C(CF_2)_2CF_2CF_2CF_3$	90	1,330	60
Me	$CH_2CF_2CF_2H$	91	1,422	71
	$CH_2(CF_2CF_2)_2H$	91	1,400	50
	$C(CF_2)_2CF_2CF_2CF_3$	90	1,346	62

Polymers based on CH_2=CHC(O)OZ acrylates (where Z is fluorine containing alkyl or polyfluoroben groups) possess optical and physical characteristics, that allows to use them in optical devices as optical f [79]. The synthesis of such polymers was carried out according to the following procedure.

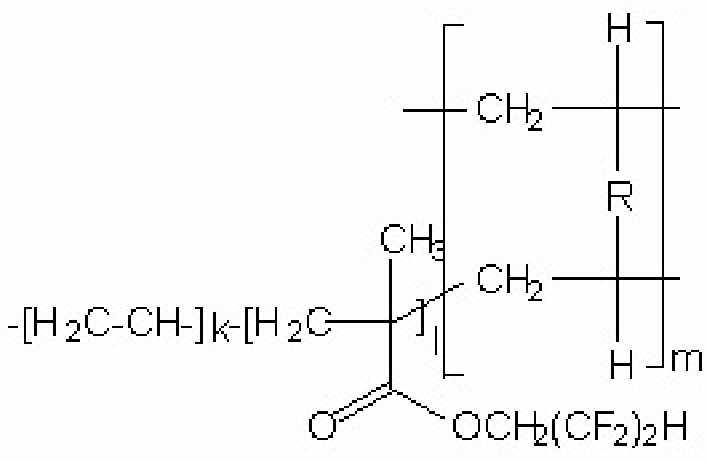


Transparent fluorine containing co-polymers of acrylates were used to obtain materials for plastic op glass fiber and optical light guides [178].

Fluorine containing acrylates are used to create optical membranes of low refracting index and refle factor (no higher than 1.4 %) [179]. Co-polymers based on *1H,1H,5H*-trihydroperfluoropentylacrylate 2(perfluoroctyl)-ethylacrylate and alkylacrylates are thermally resistant and stable to solvent influence produce transparent coatings useful for optical materials [134]. Such polymers were used to create LC op elements [180] and photo-receivers and air photography devices [181].

Co-polymers of *1H,1H,3H*-trihydrotetrafluoropropylmercaptane (**6**) and *1H,1H* trihydrooctafluoramylacrylate with 1-vinylimidazole, 1-vinyl-1,2,4-triazole and 5-vinyl tetrazole were use create electrochemical sensor based on NO suitable for use in biological media [182]. Nitrogen oxide ope as an important participant in mammal physiology and its concentration may serve as criteria during diagno of different human diseases. Obtained co- polymers due to content of fluoracrylate fragments dissolve ir majority of organic solvents and possess film forming properties. They can be used as effective pol membranes to create maximum NO-selective electrochemical sensor.

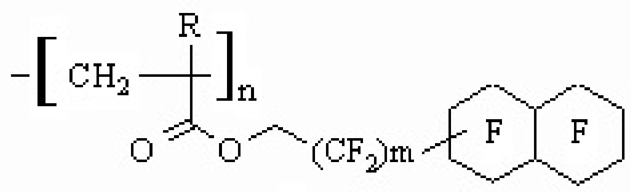
The presence of fluorine atom in a side radical of compound **6** forwards the increasing of gas penetral elasticity, mud-repellency in cross-linked hydrogel. One of important properties of such fluorine conta polymers is their ability to prevent surface of optical materials from being cluttered, that is used for produ of plastic lenses, contact lenses, optical filters, plastic mirror surfaces, protection of shatterproof multi automobile glass. Thus co-polymer **7** based on *1H,1H,3H*-trihydrotetrafluoropropylacrylate and 1-vinyl-1 triazole was used to create material for soft contact lenses [101]. The water absorbing index of this mater 60-90%, the refraction index in dry form is more then 1.5670, in swollen form it is equal to 1.4513 and dens 1.651 - 1.710 g/cm^3 (at 20 ^{o}C). Such polymer material is durable in terms of mechanics and can be use working with diamond cutter at lathe, it also can resist a week treatment with 0.1 N solutions of NaOH and without water absorbing and optical parameters change.



k+l = 20-100;

R = $-CH_2-$, -[(CONH)-CH-]-

The penetrating power of co-polymer **8** of 1-(methacryloxymethyl)perfluorodecaline and methyl-methacr and tris-(trimethylsiloxi)silylpropylmethacrylate with MW 300000 for molecular oxygen was 22.6*10^{-11} m cm/cm^2, that influences positively the contact of lens and lens surface [183].



8

R = H, Me; m = 0-5

Co-polymers 2(perfluoroctyl)ethylmethacrylate **9** wit γ -methacryloxypropyltrimethyl-oxysilane proved t suitable materials for production of contact lenses [184].

9

R = H, Me, F; a = 2-4; b = 3-14; c = 0, 1; d = 1, 2

We'd like to draw your attention to opportunities of fluorinated diols as semi-products for synthesis of pol materials for different technical purposes [61-63]. The presence of perfluoroalkyl and hydrophilic grou polymer increases adsorption of oxygen and biocompatibility with body tissues, that is used, for example production of contact lenses [185-191] and for production of venous vessels and prosthesis [71,192].

Polymers based on fluorine containing ethers of maleic acid are used for compositions of thermal resi
coatings, for impregnation of cotton, wool, nylon, dacron, and fabrics made of glass fiber as water-, mud-
grease-repellent films [107].

Acrylates fluorine modified by ester group are used to obtain filtering materials by treating of po
materials with fluorine containing polymers [10]. Such filters are high water- and oil-repellent. They are u
for producing of different semi-products for medical, researching, consumer and industrial applications. Ma
perfluoroalkylesters of methacrylic acid were used.

Esters of fluorine alcohols and saturated acids can be used as lubricating materials, plasticizers, hydr
liquids, and also to obtain polymers and co-polymers which are insoluble in common solvents, used to ol
coatings [193, 194].

A transfer to science intensive production can't be carried out without renewal of equipment, enforceme
industrial safety standards, protection of equipment, functioning under conditions of corrosion active m
influence. Providing of corrosion proofness of main industrial funds must become a main scientific and tech
goal and an important subject for the field of ecological and man-caused safety management. Fluorine mate
of wide application field should play the decisive part to solve this problem, because they possess a numb
unique properties.

Conclusion

As we see from the experimental data listed above the fluorine containing chemicals based on flu
derivatives of acrylic, methacrylic and maleic acids found their wide application for providing materials
water- and oil-repellent properties, which effectiveness is essentially higher than the ones of siloxane compou
The application of coatings made of these materials, which showed high consumer characteristics has
started. As the achieving of fluorine chemicals high activity is becoming more and more important facto
development of fine organic synthesis, it is obvious that new approaches listed in this review will find a
application to carry out aimed synthesis of potential compounds of wide practical application field. This cla
compounds is of deep interest of not only scientific, but also of application aspects. Realizing the significan
fluorine materials is a guarantee for success of this chemistry field.

References

[1] Feiring A.E. // in *Organofluorine Chem.* Eds. Banks R.E., Smart B.E., Tatlow
Plenum : New York. N. Y. 339-372 (1994)

[2] Milker R., Moeller B. // *Tech. Mitt.* **87**, 96-99 (1994); Chem. Abstr. 1995. **1**
170971.

[3] Ishikawa N., Kobayashi Y. // Fluorine compounds. – Chemistry and Applicat
Trans. In Japanese M.V. Pospelov. Ed. A.V. Forin. Ě. : Ěir. 1982. 276 P.

[4] Boguslavskaya L.S., Panteleeva I.Yu., Morozova T.V., Kartartasjov A.V., Chuva
N.N. // *Uspekhi Khim.* **59**, 1555-1575 (1990).

[5] Sletkina L.S., Redina L.V., Kolokolkina N.V.// *Khim. Volokna.* 27-29 (1995); Ch
Abstr. 1999. **128**, 62728.

[6] Shimizu T., Yano S. (Daikin Industries, Japan) // *Kobunshi Kako.* **46**, 13-19 (19
Chem. Abstr. 1998. **126**, 212582.

[7] Chuvatkin N.N., Panteleeva I.Yu. // In *Modern fluoropolymer.* Ed. J. Scheirs. Wil
New York. 1997. P. 191.

[8] Clark J.C., Newland J.C., Ramrath R.F., Burleigh M.B., Schaffer K.R. // *Pat.*
6613862 (2003). C08G018/79.

[9] Soane D.S., Offord D.A. // *Pat. U.S.* 6617267 (2003). B32 B 027/12.

[10] Yao L. (Polex Technologies Corp., USA) Pat. U.S. 6638610 (2003); B 32 B 003 B 32 B 027/14.

[11] Lui N., Podszum W. // *Eur. Pat. Appl. EP* 744394 (1996); Chem. Abstr. 1997. **1** 19428n.

[12] Moore G.G.I., Mc Cormick F.B., Chattoraj M., Cross E.M., Liu J.J., Roberts R Schulz J.F. // *Pat. U.S.* 6005137 (1999).

[13] Fielding H.C. // in *Organofluorine Chemical and their industrial Application*. (R.E. Banks) Ellis Horwood : Chichester. 1979. P. 214.

[14] Bernar B., Devaty J., Kralicek J., Zachoval J. // *Org. Coat. Appl. Polym. Sci. Pr* **48**, 711 (1983).

[15] Yong T.-M., Hems W.P., van Nunen J.L.M., Holmes A.B., Steinke J.H.G., Ta P.L., Segal J.A., Griffin D.A. // *J. Chem. Soc., Chem. Commun.*, 1811 (1997).

[16] Bednar B., Marousek V., Zachoval J., Paleta O. // *Pat. Czech. CS* 273782 (19 Chem. Abstr. 1993. **120**, 120754s.

[17] Paleta O., Danda A., Stepan L., Kvicala J., Dedek V. // *J. Fluorine Chem.*, **45**, (1989).

[18] *Pat. U.S.* 2642416 (1952) (Minnesota Mining & Mfg. Co.).

[19] Blochel W. // *Pat. U.S.* 3285393 (1970).

[20] Millauer H. // *Pat. Ger.* 2318677 (1975).

[21] Yamaguchi F., Takaki S., Yoshizawa T., Ogura E., Katsube // *Pat. U.S.* 6187 (2001).

[22] Uklonskii I.P., Denisenkov V.F., Il`in A.N., Ivanova I.M., Bakhmutov Yu Mineev S.N. // *Pat. RU* 2150459 (2000); Chem. Abstr. 2002. **136**, 218614b.

[23] Wada A., Tanaka H., Tanabe K., Yamagishi N., Toma T. // *Claim 1191009,* (2002).

[24] Blickle P., Heumueller R., Hintzer K., Schwertfeger W., von Werner K. / *Offen DE* 3915759 (1990); Chem. Abstr. 1991. **114**, 184789r.

[25] Skibida I.P., Sakharov A.M., Bakhmutov J.L., Denisenkov V.F., Martynova N *Pat. U.S.* 5495034 (1996); Russ. Chem. Abstr.1997. 20Í 105Ď.

[26] Ichihara K., Aoyama H. / *Appl. 1085006*EP(2001);

[27] Nguyen T., Wakselman C. // *Synth. Commun.* **20**. 97-99 (1990).

[28] Maksimov B.N., Kosareva L.N., Ryabinin N.A. // *Pat. RU* 2107751 (1993);

[29] Szlavik Z., Tarkanyi G., Skribanek Z., Vass E., Rabai J. // *Org. Lett.*, **3**. 2365-2

(2001); Chem. Abstr. 2001. **135**, 210736b.

[30] Il`in A.A., Ivanova L.M., Il`in A.N., Furin G.G., Pokrovsky L.M. // *Zh. Prikl. Kh* in press.

[31] Wada A., Tanaka H., Tanabe K., Yamagishi N., Toma T. // *Claim 1191009* (2002);

[32] Yashizawa T., Takai S., Yasuhara T., Yokoyama Y. (Daikin Industries, Ltd., Jap // *Appl. 1179521 EP* (2002);

[33] Oharu K. (Asahi Glass Co., Ltd., Japan) // *PCT Int. Appl. WO* 02 28807 (20 Chem. Abstr. 2002. **136**, 294534r.

[34] Ishihara K., Homoto Y., Baba N. (Daikin Industries, Ltd., Japan) // *Jpn Ko Tokkyo Koho JP* 53505 (2002); Chem. Abstr. 2002. **136**, 167088y.

[35] Haszeldine R.N., Rowland R., Sheppard R.P., Tipping A.E. // *J. Fluorine Che* **28**, 291 (1985).

[36] Paleta O., Dedek V., Routschek H., Timpe H.-J. // *J. Fluorine Chem.*, **42**, (1989).

[37] Paleta O., Dedek V., Neuenfeld S., Timpe H.-J. // *Pat. Czech.*268 247 (1989); Pa O., Kvicala J., Budkova Z., Timpe H.J. // *Collect. Czech. Chem. Commun.*, **60**, 636- (1995); Chem. Abstr. 1995. **123**. 111327q; Yoshizawa T., Takaki S., Yasuhara Yokoyama Y. (Daikin Industries, Ltd., Japan) // *Pat. Eur. Pat. Appl. EP*. 967193 (19 Chem. Abstr. 2000. **132**. 51457f.

[38] Takaki S., Yoshizawa T. (Daikin Industries, Ltd., Japan) // *Pat.. Eur. Pat. Appl.* 968990 (2000); Chem. Abstr. 2000. **132**, 65740e.

[39] Yoshizawa T., Takaki S. (Daikin Industries, Ltd., Japan) // *Pat. PCT Int. Appl.* 02 18308 (2002); Chem. Abstr. 2002. **136**, 233886k.

[40] Yamaguchi F., Katsube T. // *Pat. U.S.* 6313357 (2001);

[41] Takaki S., Yoshizawa T. // *Pat. U.S.* 6294704 (2001);

[42] Yoshizawa T., Takaki S. (Daikin Industries, Ltd., Japan) // *Pat. PCT Int. Appl.* 02 18309 (2002); Chem. Abstr. 2002. **136**, 218630d.

[43] Guiot J., Alric J., Ameduri B., Rousseau A., Boutevin B. // *New J. Chem.*, **25**. 1 1190 (2001); Chem. Abstr. 2002. **136**, 37984b.

[44] Chambers R.D., Grievson B. // *J. Chem. Soc., Perkin Trans, 1,* 2215 (1985).

[45] Chambers R.D., Grievson B. // *J. Fluorine Chem.*, **29**, 323 (1985).

[46] Motherwell W.B., Crich D. // *Free Radical Chain Reactions in Organic Synthe* Academic Press Ltd. : London. 1992.

[47] Okamoto H. (Asahi Glass Co., Ltd., Japan) // *Pat. PCT Int. Appl. WO*. 02 16 (2002); Chem. Abstr. 2002. **136**, 199936q.

[48] Uklonskii I.P., Denisenkov V.F., Il`in A.N., Mineev S.N., Bakhmutov Yu Ivanova L.V. // *Russ. RU* 2209204 (2003); Chem. Abstr. 2004. **140**, 305758c.

[49] Furin G.G., Il`in A.A., Ivanova L.M., Bakhmutov Yu.L., Il`in A.N., Suchinin V Tolstikova T.G. // *Zh. Prikl. Khim.*, **77**, 102-105 (2004).

[50] Wada A., Fujima T., Kawahara K. (Asahi Glass Co., Ltd., Japan) // *Pat. Jpn. Ko Tokkyo Koho JP*. 2002173454 (2002); Chem. Abstr. 2002. **137**, 20153.

[51] Cirkva V., Polak R., Paleta O. // *J. Fluorine Chem.* **80**, 135-144 (1996).

[52]. Kurykin M.A., German L.S., Kartasheva L.I., Pikaev A.K. // *J. Fluorine Chem.* 193-194 (1996).

[53] Chambers R.D., Kelly N., Emsley J.M., Jones W.G.M. // *J. Fluorine Chem.*, **13** (1979).

[54] Muramatsu H., Moriguchi S., Inukai K. // *J. Org. Chem.*, **31**, 1306 (1966).

[55] Chambers R.D., Diter P., Dunn S.N., Farren C., Sandford G., Batsanov A Howard J.A.K. // *J. Chem. Soc., Perkin Trans, 1,* 1639-1649 (2000).

[56] Kawa H. // *Pat. U.S.* 6479712 (2002);

[57] Udagawa A. // *Jpn. Kokai Tokkyo Koho JP* 240571 (2001); Chem. Abstr. 20 **135**, 212588d.

[58] Paleta O., Palecek J., Michalek J. // *J. Fluorine Chem.,* **114**, 51-53 (2002).

[59] Seki T., Shimada M., Oharu K., Maekawa T. (Asahi Glass Co., Ltd, Japan) *Kokai Tokkyo Koho JP* 2003335773 (2003); Chem. Abstr. 2003. **139,**396928; Homoto Tanaka K. (Daikin Industries, Ltd, Japan) *Pat. Int Appl. WO* 2002062735 (2002); Ch Abstr. 2003. **137**, 140932.

[60] Podsevalov P.A., Furin G.G. // on-lain Journal *Fluorine Notes.* In press; Haniff Falk R.A., Deisenroth T., Mueller K.F. (Ciba-Geigy A.-G.) // *Eur. Pat. Appl. EP* 690 (1996); Chem. Abstr. 1996. **124**, 234995.

[61] Boutevin B., Robin J.J. // *Adv. Polym. Sci.,* **102**, 105 (1992).

[62] Guyot B., Ameduri B., Boutevin. // *J. Fluorine Chem.* **74**, 233-240 (1995).

[63] Wood C.D., Michel U., Rolland J.P., DeSimone J.M. // *J. Fluorine Chem.,* **125**, 16 1676 (2004).

[64] Udagawa A. // *Pat. Jpn. Kokai Tokkyo Koho JP*. 240571 (2001); Chem. Ab 2001. **135**, 212588d.

[65] Paleta O., Palecek J., Michalek J.// *J. Fluorine Chem.* **114**, 51-53 (2002).

[66] Boutevin B., Pietrasanta Y. // *Les Acrylates et Polyacrylates Fluores : Derive Applications.* EREC, Paris. 1988.

[67]. Russo A., Tonelli C. // *J. Fluorine Chem.*, **125**, 181-188 (2004).

[68] Sianesi D., Caporiccio G., Mensi D. // *Pat. U.S.*3847978 (1974).

[69] Sianesi D., Marchionni G., De Pasquale R.J. // *Organofluorine Chemist Prinsiples and Commercial Applications*. Eds. R.E. Banks et al. Plenum Press : N York. 1994.

[70] Saloytina L.V., Zapevalov A. Ya., Kodess M.I., Kolenko I.P. // *Zh. Org. Khim.,* 788-793 (1982).

[71] Paleta O., Cirkva V., Kvicala J. // *Macromol. Symp.*, 82, 111 (1994); Kvical Dolensky B., Paleta O. // *J. Fluorine Chem.,* **85**, 117-125 (1997); Vilenchik Y Lekontseva G.I., Neifel`d P.G., Pospelova N.B. // *Zhur. Vses. Khim. Obshch. Mendeleeva USSR* , **26**, 212,213 (1981); Paleta O., Dabda A., Stepan L., Kvical Dedek V. // *J. Fluorine Chem.,* **45**, 331 (1989); Howell J.L., Lu N., Friesen C.M. *Fluorine Chem.,* **126**, 281-288 (2005); Ohmori A., Tomihaski N., Tamaru S. // *Eur. Appl. EP* 07959 (1982).

[72] Cirkva V., Bohm S., Paleta O. // *J. Fluorine Chem.,* **102**, 159-168 (2000).

[73] Cirkva V., Paleta O. // *J. Fluorine Chem.,* **94**, 141-156 (1999).

[74] Ayari A., Szonyi S., Rouvier E., Cambon A. // *Bull. Soc. Chim. Fr.,* **129**, 315 (19

[75] Paleta O., Budkova Z., Kvicala J., Timple H.-J. // *Coll. Czech. Chem. Commun.,* 636 (1995).

[76] Paleta O., Cirkva V., Kvicala J. // *J. Fluorine Chem.,* **80**, 125 (1996).

[77] Cirkva V., Polak R., Paleta O. // *J. Fluorine Chem.,* **80**, 135 (1996).

[78] Paleta O., Budova Z., Kvicala J., Timple H.-J. // *Tetrahedron Lett.,* **32**, 251 (199

[79] Moore G.G.I., McCormick F.B., Chattoraj M., Cross E.M., Liu J., Jacob R.R Schulz J.F. // *Pat. U.S.* 6005137 (1999);

[80] Goldinov G.S., Averbach K.O., Nekrasova L.A. // *Zh. Prikl. Khim.* **49**, 1341-1 (1976).

[81] Goldinov G.S., Averbach K.O., Nekrasova L.A., Lavigin I.A., Leitan C Chalbisheva N.V. // *Zh. Prikl. Khim.* **58**, 1349-1353 (1985).

[82] *Pat. Japan* 59-181239 (1984)

[83] Goldinov G.S., Averbach K.O., Nekrasova L.A. // *Zh. Prikl. Khim.* **57**, 1577-1 (1984).

[84] Hayashi T., Yamaguchi H. (Asahi Glass Co., Ltd.) // *Pat. Japan* 73 30611 (19 Chem. Abstr. 1974. **80**, 26771.

[85] Homoto Y., Tanaka K. (Daikin Industries, Ltd., Japan)// *PCT Int. Appl.* 2002062735 (2002); Chem. Abstr. 2003. **137**. 140932.

[86] Kashkin A.V., Bakhmutov Yu.L., Marchenko N.N. // *Pat. USSR* 316686 (1969).

[87] Hoshino Y., Shimada M., Maekawa T. (Asahi Glass Co., Ltd, Japan) // *Jpn. Ko Tokkyo Koho JP* 204250379 (2004); Chem. Abstr. 2004. **141**, 226367.

[88] Bradley D., Ma J.-J., Nalewajek D., Samuels G.J., Stachura L.M., Van der Puy (Honeywell Interrnational Inc., USA) // *PCT Int. Appl. WO* 2002103103 (2002): Ch Abstr. 2004. **138**, 57436.

[89] Cassidy P.E., Aminabhavi T.M., Reddy V.S., Fitch J.W. // *Eur. Polym. J.* **31**, 353- (1995); Chem. Abstr. 1995. **122**, 241099.

[90] Huber-Emden H., Schaefer P. (Ciba-Geigy A.-G.) // *Ger. Offen* 2350571 (19 Chem. Abstr. 1975. **83**, 59741.

[91] Taniguchi N. (Nippon Kayaku Co., Ltd., Japan) // *Jpn. Kokai Tokkyo Koho* 2002003550 (2002); Chem. Abstr. 2003. **136**, 70726.

[92] Masutani T., Kokawa H., Itami Y., Mori H. (Daikin Industries, Ltd., Japan) // *Kokai Tokkyo Koho JP* 2004225019 (2004); Chem. Abstr. 2004. **141**, 191403.

[93] Taniguchi N. (Nippon Kayaku Co., Ltd., Japan) // *Jpn. Kokai Tokkyo Koho* 2002128816 (2002); Chem. Abstr. 2003. **136**, 356095.

[94] Krespan C.G. // in *Chemistry of Organic Fluorine Compounds. II. A Crit Review*. Eds. M. Hudlicky, A.E. Pavlath. 1995. Vol. 185, ACS Monograph 1 American Chemical Society. Washington, DC, P.297 and 311-312.

[95] Taniguchi N., Yokoshima M. (Nippon Kayaku Co., Ltd., Japan) // *Jpn. Ko Tokkyo Koho JP* 2000044650 (2000); Chem. Abstr. 2000. **132**, 153356.

[96] Taniguchi N. (Nippon Kayaku Co., Ltd., Japan) // *Jpn. Kokai Tokkyo Koho* 2002308829 (2002); Chem. Abstr. 2003. **137**, 312002.

[97] Bradley D., Ma J.-J., Nalewajek D., Samuels G.J., Stachura L.M., Van der Puy Nair H. (Honeywell International Inc., USA) // *PCT Int. Appl. WO* 2002102758 (20 Chem. Abstr. 2004. **138**, 56391.

[98] Akira O., Shoji T., Takahiro K. // *Pat EPO.* 1366668 (1985).

[99] Akira O., Shoji T., Takahiro K. // *Pat. U.S.*4604482 (1987);

[100] Akira O., Takahiro K. , Shoji T. // *Claim Japan*. 61-85345 (1987);

[101] Ermakova T.G., Kuznezhova N.P. // Seminare "*Fluoropolymers materia fundametral, prikladnoy in proizvotstvenye aspects*", Istomino, ozero Baikal. 9-11 A 2003. Abstr.SO-11. P. 103.

[102] Boutevin B., Rousseau A., Bosc D. // *J. Polym. Sci., Polym. Chem.,* **30**, 1 (1992).

[103] Knoche Th., Mueller L., Klein R., Neyer A. // *Electron Lett.,* **32**, 1284 (1996).

[104] Heumueller R., Herbrechtsmeier P., Siegemund G., Groh W. // Ger. Offen 3620050 (1988) (Hoechst A.-G.); Chem. Abstr. 1988. **108**. 205235.

[105] Blazejewski J.-C., Hofstraat J.W., Lequesne C., Wakselman C., Wiersum U.E. *Fluorine Chem.,***97**, 191-199 (1999).

[106] Blazejewski J.-C., Hofstraat J.W., Lequesne C., Wakselman C., Wiersum U.E. *Fluorine Chem.,* **91**, 175-177 (1998).

[107] Holland D.G., Deitchman B.D. // *Pat. US* 3868408 (1975) C07C69/52; 19 24Í48Ď.

[108] Goldinov G.S., Averbach K.O., Nekrasova L.A., Kisin A.V. // *Zh. Obshch. Kh* **47**, 1086-1088 (1977).

[109] Zimmerman R.L. // *Pat. US* 3128303 (1964) (The Dow Chemical Co.).

[110] Schinzel E., Kleber R. // *Pat. Ger.* 3204378 (1983) (Hoechst A.-G.);

[111] Il`in A.N., Bakhmutov Yu.L., Il`in A.A., Ivanova L.M.// Semin *"Fluoropolymers materials : fundametral, prikladnoy in proizvotstvenye aspec* Istomino, ozero Baikal. 9-11 Aug. 2003. Abstr. CO-14. P. 109-110.

[112] Pechhold E. // *PCT Int. Appl. WO* 9711218 (1997) (E.I. Du Pont De Nemours Company, USA); Chem. Abstr. 1998. **126**. 306362.

[113] Goldinov G.S., Averbach K.O., Nekrasova L.A. // *Zh. Prikl. Khim.* **50**, 908- (1977).

[114] Goldinov G.S., Averbach K.O., Nekrasova L.A. // *Zh. Kolloid. Khim.* **39**, 134- (1977);

[115] Samarina A.V., Kutergina I.A., Burtseva V.V., Monich I.M., Perevaryukha M Ovchinnikov E.Yu. // *Russ. RU* 2064938 (1996); Chem. Abstr. 1997. **126**. 294169.

[116] Ohmori A., Tomihashi N., Kitahara T. (Daikin Kogyo Co., Ltd.) // *Eur. Pat. A EP* 128516 (1984); Chem. Abstr. 1985. **102**. 185964.

[117] Tanaka K., Higuchi T., Hashimoto Y. (Dainippon Ink and Chemicals, Inc, Jap // *Jpn. Kokai Tokkyo Koho JP* 10309455 (1998); Chem. Abstr. 1999. **130**, 53715.

[118] Alanzo V., Locatelli M., Giordano S., Li B.G. (Lamberti S.p.A., Italy) // *Eur. Appl. EP*1162218 (2001); Chem. Abstr. 2003. **136**, 38907.

[119] Amimoto Y., Shinjo M., Enomoto T., Hayashi K. (Daikin Ind., Ltd., Japan) *U.S.* 5055538 (1991); Rus. Chem. Abstr. 1993. 2T 441P.

[120] Samukawa H. (Sony Chemicals Corp., Japan) // *Eur. Pat. Appl. EP* 882 (1998); Chem. Abstr. 1999. **130**, 52830.

[121] Linemann R., Malner T., Brandsch R., Bar G., Mulhaupt R. // *Polym. Prepr. (Chem. Soc., Div. Polym. Chem.).* **39**, 966-967 (1998); Chem. Abstr. 1999. **129**, 261198

[122] Suzuki Y., Hidaka H. (Dainippon Ink & Chemicals, Japan) // *Jpn. Kokai Tok Koho JP* 07 228638 (1995); Chem. Abstr. 1996. **124**, 31953.

[123] Kim I.P., Barkalov I.M., Baibikov F.A., Allayarov S.R., Rostomchanov M.G. //

Akademy Nauk SSSR. Ser. Khim. 1330-1334 (1991).

[124] Fitzgerald J.J. (E.I. du Pont de Nemours and Company, USA) // *PCT Int. A WO* 9943725 (1999); Chem. Abstr. 1999. **131**, 186186.

[125] Komoriua H., Koga N., Tsutsumi K., Maeda K. (Central Glass Co., Ltd., Japa *Jpn. Kokai Tokkyo Koho JP* 2002201231 (2002); Chem. Abstr., 2003. **137**, 94198.

[126] Morita M., Nagashima A., Watanabe T. (Daikin Industries, Ltd., Japan) // *Kokai Tokkyo Koho JP* 2001131022 (2001); Chem. Abstr., 2001. **134**, 357377.

[127] Dong D., Liu B., He R. (Wujiang Silk Co., Ltd., Peop. Rep. China) // *Fan Zhuauli Shenqing Gongkai Shuomingshu CN* 1270250 (2000); Chem. Abstr., 2001. **1** 327844.

[128] Morita M., Watanabe T., Nagashima A. (Daikin Industries, Ltd., Japan) // *Kokai Tokkyo Koho JP* 2001131023 (2001); Chem. Abstr., 2001. **134**, 357380.

[129] Zhang B., Zhang Z., Wan X., Hu C., Ying S. // *Gaofenzi Xuebao*, 906-909 (20 Chem. Abstr., 2004. **140**, 271301; Boutevin B., Rigal G., Rousseau A. // *J. Fluo Chem.*, 1988. **38**, 47-73.

[130] Tanaka H., Suzuki Y., Yoshino F (Dainippon Ink and Chemicals, Inc, Japa *Jpn. Kokai Tokkyo Koho JP* 11269238 (1999); Chem. Abstr. 1999. **131**, 258990.

[131] Kim S.-S., Lee S.-W., Haw J.-L., Huh W.S. // *Polymer (Korea)* **26**, 9-17 (20 Chem. Abstr., 2003. **136**, 325910.

[132] Maruyama T., Aiki Y., Komatsu M. (Lion Corp. Japan) // *Jpn. Kokai Tokkyo K JP* 2002105433 (2002); Chem. Abstr., 2003. **136**, 310586.

[133] Lore A.L., Raynolds S. (du Pont de Nemours, E.I. and Co.) // *Pat. U.S.* 4127 (1978); Chem. Abstr. 1979. **90**, 88714.

[134] Taniguchi N. (Nippon Kayaku Co., Ltd., Japan) // *Jpn. Kokai Tokkyo Koho* 2004035852 (2004); Chem. Abstr. 2004. **140**, 147747.

[135] Abele B.C., Mahr G., Winterfeld J., Wimmer F., Spannbrucjer A. (Wac Chemie G.m.b.H., Germany) // *Ger. Offen DE* 19923477 (2000); Chem. Abstr. 2001. **1** 6004.

[136] Matsui H., Shiraishi N. // *Mokuzai Gakkaishi.*, **46**, 468-474 (2000); Chem. Ab 2001. **134**, 239072.

[137] Fukuchi Y. (Toyo Ink Mfg Co., Japan) // *Jpn. Kokai Tokkyo Koho JP* 07 331 (1995); Chem. Abstr. 1996. **124**, 235035.

[138] Shimizu T., Dejima H., Aoyanagi M. (Kao Corp., Japan) // *Jpn. Kokai Tok Koho JP* 08 81883 (1996); Chem. Abstr. 1996. **125**, 60913.

[139] Kubo M., Enomoto T. (Daikin Industries, Ltd., Japan) // *PCT Int. Appl. WC* 12775 (1996); Chem. Abstr. 1996. **125**, 60908.

[140] Kubo M., Enomoto T. (Daikin Industries, Ltd., Japan) // *PCT Int. Appl. WC*

18764 (1996); Chem. Abstr. 1996. **125**, 170813.

[141] Hwang F.S., Hogen-Esch T.E. // *Macromolecules.* **28**, 3328-3335 (1995); Ch
Abstr. 1995. **122**, 215092.

[142] Noji A. (Nok Corp., Japan) // *Jpn. Kokai Tokkyo Koho JP* 07 268026 (1995); Ch
Abstr. 1996. **124**, 148513.

[143] Yasuda G., Kashiwagi K. (Asahi Glass Co., Ltd., Japan) // *Jpn. Kokai Tok
Koho JP* 11255829 (1999); Chem. Abstr. 1999. **131**, 229178.

[144] Kakimoto M., Kojima H., Okuda Y., Fukuda Y., Tanaka G. (Sumitomo Elec
Industries, Ltd., Japan) // *Jpn. Kokai Tokkyo Koho JP* 08 48782 (1996); Chem. Ab
1996. **124**, 345007.

[145] Sletkina L.S., Kolokolkina N.V., Redina L.V., Plotnikova E.V. // *Fibre Chem.*,
123-125 (1997); Chem. Abstr. 1999. **128**, 14093.

[146] Kubo M., Morita M., Uesugi N. // (Daikin Industries, Ltd., Japan) *PCT Int. A
WO* 95 18194 (1995); Chem. Abstr. 1995. **123**, 172574.

[147] Raiford K.G., Greenwood E.J., Dettre R.H. (du Pont de Nemours, E.I. and
USA) // *Pat. U.S.* 5344903 (1994); Chem. Abstr. 1995. **122**, 33510.

[148] Sumitomo M., Setoyama K., Misu T., Matsuhira S. (Showa Denko K.K., Japa
Jpn. Kokai Tokkyo Koho JP 10249806 (1998); Chem. Abstr. 1999. **129**, 303863.

[149] Ito K., Kamata T. (Asahi Glass Co., Ltd., Japan) // *Jpn. Kokai Tokkyo Koho JI*
271839 (1994); Chem. Abstr. 1995. **122**, 216493.

[150] Sletkina L.S., Redina L.V., Kolokolkina N.V., Savosina G.N., Vedeneeva I
Fibre Chemistry. **36**, 37-40 (2004); Chem. Abstr. 2004. **1241**, 315738; Lonati
AlAchari A., Ghenaim A., Caze C. // *Text. Res. J.* **69**, 381-387 (1999); Chem. Abstr. 19
131, 89005.

[151] Dejima H., Hishige T., Aoyanagi M. (Kao Corp.) // *Jpn. Kokai Tokkyo Koho JI*
11241 (1995); Chem. Abstr. 1995. **122**, 316869.

[152] Lyanagi K. (Pola Chemical Industries, Inc., Japan) // *Jpn. Kokai Tokkyo Koh*
2004123726 (2004); Chem. Abstr. 2004. **140**, 344512.

[153] Lyanagi K. (Pola Chemical Industries, Inc., Japan) // *Jpn. Kokai Tokkyo Koh*
2004115502 (2004); Chem. Abstr., 2004. **140**, 326639.

[154] Nakahara Y., Naniwa K. (Asahi Denka Kogyo K.K., Japan) // *Jpn. Kokai Tok
Koho JP* 11228501 (1999); Chem. Abstr., 1999. **131**, 171888.

[155] Lyanagi K., Iida M. (Pola Chemical Industries, Inc., Japan) // *Jpn. Kokai Tok
Koho JP* 2004115501 (2004); Chem. Abstr., 2004. **140**, 326638.

[156] Kaida Y., Yamamoto H. (Asahi Glass Co., Ltd., Japan) // *Jpn. Kokai Tokkyo K
JP* 2004035865 (2004); Chem. Abstr., 2004. **140**, 146654.

[157] Lyanagi K. (Pola Chemical Industries, Inc., Japan) // *Jpn. Kokai Tokkyo Koh*

2004123727 (2004); Chem. Abstr., 2004. **140**, 344513.

[158] Lyanagi (Pola Chemical Industries, Inc., Japan) // *Jpn. Kokai Tokkyo Koho* 2004123725 (2004); Chem. Abstr., 2004. **140**, 344522.

[159] Domschke A.M., Franis V.M. (Novartis A.-G.) // *PCT Int. Appl. WO* 2000078 (2000); Chem. Abstr. 2001. **134**, 57126.

[160] Nakahara Y., Naniwa K. (Asahi Denka Kogyo K.K., Japan) // *Jpn. Kokai Tok Koho JP* 11228501 (1999); Chem. Abstr. 1999. **131**, 171888.

[161] Kim D.-K., Park I.-J., Choi Y.-K., Lee S.-B. // *2nd International Confere "Chemistry, Technology and Application of Fluorocompounds",* Sept. 23-26, 1997. Petersburg, Russia. Abstracts. P 2-21. P. 92.

[162] Harada E., Higuchi H., Omura H., Suyama S. (Nippon Oil and Fata Co., L Japan) // *Jpn. Kokai Tokkyo Koho JP* 1027983 (1998); Chem. Abstr. 1999. **129**, 34451

[163] Miyata T., Yamada H., Uragami T. // *Macromolecules.* **34**, 8026-8033 (20 Chem. Abstr. 2003. **136**, 54725.

[164] *Fluoropolymers.* Ed. L.A. Wall. Wiley-Interscience A Division of John Wil Son., Inc. N.Y., 1972. Russian Transl. M. : Mir. 1975. 448 P.

[165] Keningsberg Y., Shchori E. (Gelman Sciences Technology, Inc.) *PCT Int. A WO* 91 01791 (1991); Pat. U.S. 5156780 (1992); Chem.Abstr. 1991. **115**, 94542.

[166] Nakamura T., Tasaka T., Sugiura M. (NOF Corporation, Japan) // *Jpn. Ko Tokkyo Koho JP* 2002097338 (2002); Chem. Abstr. 2003. **136**, 280231.

[167] Yamaguchi F., Takaki S., Yoshizawa T., Ogura E., Ratsube T. (Daikin Industr Ltd., Japan) // *Pat. Eur. Pat. Appl. EP.* 968989 (2000); Chem. Abstr. 2000. **132**. 65739

[168] Akira O., Nobuyuki T., Takahiro K. // *Pat EPO* 128516 (1985); Chem. Ab 1985. **102**, 185964h.

[169] Akira O., Nobuyuki T., Takahiro K. // *Pat EPO* 128517 (1985); Chem. Ab 1985. **102**, 115070g.

[170]Akira O., Takahiro T., Takahiro K. // *Claim Japan.* 60-118808 (1987);

[171] Bosc D., Boutevin B., Pietrasanta Y., Rousseau A. // *Claim France* 2623 (1990);

[172] Jjaa S., Koji N., Masoru M., Takashi J. // *Claim Japan* 61-121005 (1986); Ch Abstr. 1986. **105**, 192481.

[173]Takashi J., Katsuhiko S., Ryuji M. et al. // *Claim Japan* 61-240205 (1987); Ch Abstr. 1987. **106**, 139496.

[174] Tategami Y., Fujita K., Furuta M., Tamura T. // *Claim Japan* 60-250309 (19 Chem. Abstr. 1986. **104**, 226030n.

[175] Joshiharu T., Katsuramaru T., Motonobu F., Tashibubnu T. // *Claim Japan*

208006 (1987); Chem. Abstr. 1987. **106**, 68407.

[176]Shigeru M., Masahiko O.// *Claim Japan* 61-86448 (1986); Chem. Abstr. 19 **105**, 157727.

[177] *Akira O., Kazuo I.// Pat. EPO* 158113 (1985); Chem. Abstr. 1985. **104**, 89225.

[178] *Pat. U.S.* 6392105 (2002);.

[179] Oka K. (Toray Industries, Inc., Japan) // *Jpn. Kokai Tokkyo Koho JP* 11001 (1999); Chem. Abstr. 1999. **130**, 111637.

[180] Goto T., Murai H., Nakada D. (Nippon Electric Co., Japan) // Jpn. Kokai Tok Koho JP 06202086 (1994); Chem. Abstr. 1995. **122**, 93011.

[181] Sekya M., Nakamura K. (Canon Kk, Japan) // *Jpn. Kokai Tokkyo Koho* 06308756 (1994); Chem. Abstr. 1995. **122**, 226773.

[182] Petrova T.L., Kizhnyaev V.N., Kashevsky A.V., Smirnov A.I. // Semin *"Fluoropolymers materials : fundametral, prikladnoy in proizvotstvenye aspec* Istomino, ozero Baikal. 9-11 Aug. 2003. Abstr. YD-14. P. 63.

[183] Yamamoto F., Yakushiji Y. (Kuraray Co., Japan) // *Jpn. Kokai Tokkyo Koho JI* 41518 (1995); Chem. Abstr. 1995. **123**, 146123.

[184] Matsunaga T., Kono S. (Toray Industries, Japan) // *Jpn. Kokai Tokkyo Koho JI* 16940 (1995); Chem. Abstr. 1995. **123**, 171987.

[185] Tighe B.J. // in *Fluoropolymers conferences*. Ed. R.E. Banks. UMIS Manchester. Chap. 11. 1992.

[186] Refojo M.F. // in *Contact Lens Practice*. Eds. M. Ruben, M. Guillon. Chapma Hall : London. Chap. 2. 1994.

[187] Hogi T., Osawa N. // *Jpn. Kokai Tokkyo Koho JP*. 0497117 (1987); Chem. Ab 1992. **117**, 118550.

[188] Iwata J., Ikeda M. (Asahi Chemical Ind., Japan) // *Jpn. Kokai Tokkyo Koho* 9432904 (1994); Chem. Abstr. 1994. **121**, 84211.

[189] Yokoyama Y., Noriko I., Ito E., Ichinone S., Yamazaki T. // *Eur. Pat. Appl.* 600269 (1994); Chem. Abstr. 1995. **122**, 142635.

[190] Fujitani H., Komura I., Nagase H., Aoyagi T., Akimoto M. // *Jpn. Kokai Tok Koho JP*. 09291530 (1997); Chem. Abstr. 1997. **127**, 298797.

[191] Akaishi M. // *Jpn. Kokai Tokkyo Koho JP*. 10333103 (1997); Chem. Abstr. 19 **130**, 100710.

[192] *Hydrogels for medical and related applications*. // Ed. J.D. Andrade. Symposium. Series 31. Washington. 1976.

[193] *Pat. USA* 3 419 602 (1968).

[194] *Pat. USSR* 765 330 (1980).