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*Dedicated to Full Member of the Russian Academy of Sciences N.S. Zefirov on His 70th Anniversary*

# Reactions of 1,2,4,5-Tetrafluoro-3,6-bis(vinylsulfonyl)benzene with Cyclic Amines

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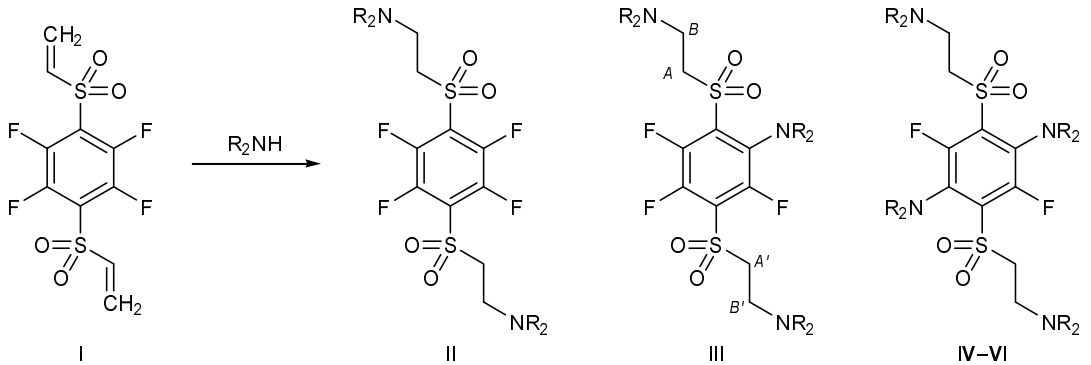
**Abstract**—Reactions of 1,2,4,5-tetrafluoro-3,6-bis(vinylsulfonyl)benzene with pyrrolidine, piperidine, and morpholine lead to formation of different products, depending mainly on the reactant ratio. In the presence of 2 equiv of cyclic amine, adducts at both vinylsulfonyl groups are formed, while in reactions with 4 equiv of cyclic amine, the addition at the double bonds is accompanied by nucleophilic replacement of one or two fluorine atoms in the benzene ring.

1,2,4,5-Tetrafluoro-3,6-bis(vinylsulfonyl)benzene (**I**) [1] is readily available via oxidation of 1,2,4,5-tetrafluoro-3,6-bis(vinylsulfanyl)benzene [2] with hydrogen peroxide. This compound is convenient for the synthesis of various polyfunctional compounds, including heterocycles, by nucleophilic addition and substitution reactions. The double C=C bonds in the vinyl groups of **I** are activated to nucleophilic addition due to electron-acceptor effect of the sulfonyl groups. As we showed previously [3] (in contrast to the data of [4, 5]), this activation is sufficient to ensure addition of 2-aminoethanethiol hydrochloride and 2-sulfanylethanol through their SH groups at both vinylsulfonyl groups in the absence of base catalyst. Likewise, the corresponding polyaddition product is readily formed from compound **I** and 1,2-ethanedithiol at 20°C.

Unexpectedly, reactions of fluorine-containing bissulfone **I** with 2-aminoethanol and allylamine gave rise to heterocyclic systems as a result of nucleophilic addition at the vinyl groups and nucleophilic replacement of fluorine atoms in the benzene ring by the amino group of 2-aminoethanol [6] or allylamine [2]. Compound **I** was found to react with thiosemicarbazide [7, 8] in ethanol or DMF (20°C) in a stepwise mode. At a reactant ratio of 1:2, 1,2,4,5-tetrafluoro-3,6-bis(2-thiosemicarbazidoethylsulfonyl)benzene was obtained in 73% yield. When the reaction was performed in DMF at 75–80°C with 4 equiv of thiosemicarbazide,

**Scheme 1.**




**II**–**IV**, $R_2N$ = piperidino; **V**, $R_2N$ = 1-pyrrolidinyl; **VI**, $R_2N$ = morpholino.

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the product was fused N,S-heterocyclic compound which was formed via nucleophilic addition of the 1-$NH_2$ group of thiosemicarbazide at the vinyl double bonds and subsequent intramolecular replacement of the *ortho*- and *meta*-fluorine atoms by the NH group or sulfur atom, respectively.

The present communication reports the results of our study on the reaction of 1,2,4,5-tetrafluoro-3,6-bis-(vinylsulfonyl)benzene (**I**) with cyclic amines, such as pyrrolidine, piperidine, and morpholine. The latter were selected, taking into account that their molecules are structural fragments of many biologically active compounds; therefore, introduction of such fragments into the molecule of vinylsulfonylfluorobenzene **I** could give rise to biological activity.

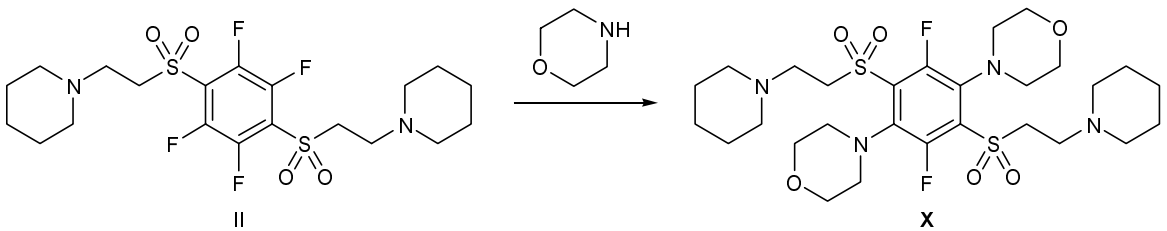
The reactions were carried out in dimethylformamide or ethanol at 55–60°C. Depending on the reactant ratio, either nucleophilic addition or nucleophilic addition and substitution products were formed. The reactions with 2 equiv of amine gave products of addition at both vinylsulfonyl groups. For example, compound **I** reacted with piperidine in DMF to give 40% of 1,2,4,5-tetrafluoro-3,6-bis(2-piperidinoethylsulfonyl)benzene (**II**) (Scheme 1). When the reactant ratio (amine–substrate) was 4:1, the addition process was accompanied by replacement of one or two fluorine atoms in the benzene ring. In the reaction with piperidine we obtained 2,4,5-trifluoro-1-piperidino-3,6-bis(2-piperidinoethylsulfonyl)benzene (**III**) in 47% yield and traces of 1,4-difluoro-2,5-dipiperidino-3,6-bis(2-piperidinoethylsulfonyl)benzene (**IV**). Under the same conditions (DMF, 55–60°C), the reaction of **I** with 4 equiv of pyrrolidine gave 65.5% of 1,4-difluoro-2,5-bis(1-pyrrolidinyl)-3,6-bis[2-(1-pyrrolidinyl)ethylsulfonyl]benzene (**V**), and the reaction with morpholine, 37% of 1,4-difluoro-2,5-dimorpholino-3,6-bis(2-morpholinoethylsulfonyl)benzene (**VI**) (Scheme 1). Obviously, the reaction direction and product yield are determined by excess amine which is necessary to bind hydrogen fluoride liberated as a result of nucleophilic substitution of the fluorine atoms. In the reaction of compound **I** with piperidine at a ratio of 1:6, the yield of **IV** increases to 65%. Likewise, 1,2,4,5-tetrafluoro-3,6-bis(vinylsulfonyl)benzene (**I**) reacted with excess morpholine (used as solvent, 55–60°C) to afford 60% of product **VI**. These data suggest that reactions of **I** with cyclic amines can be performed under solvent-free conditions.

The reactivity of cyclic amines toward compound **I** changes in accordance with their basicity (pyrrolidine ≥ piperidine > morpholine; $pK_a$ = 11.27, 11.22, and 8.33, respectively). These amines are strong bases, and they readily react with most acids to give the corresponding salts. By reaction of compound **IV** in chloroform with gaseous hydrogen chloride (20–25°C) we obtained hydrochloride **VII**. Perchlorates **VIII** and **IX** were formed on treatment of solutions of **IV** and **V**, respectively, in chloroform with 30% perchloric acid. According to the data of elemental analysis, only one nitrogen atom is protonated in molecules **IV** and **V**, presumably the one not linked to the aromatic ring. The salts thus formed separate from the solution; they are almost insoluble in water, ethanol, and dimethyl sulfoxide; therefore, interaction of the other basic centers in compounds **VII**–**IX** with an acid is excluded. Salts **VII**–**IX** are weakly soluble in water on heating to 80–90°C.

The conditions leading to formation of compounds **II**–**VI** suggest that the reaction of **I** with cyclic amines can be performed in a stepwise mode to introduce different amine residues into the substrate molecule. By treatment of compound **IV** with morpholine (DMF, 55–60°C) we obtained 1,4-difluoro-2,5-dimorpholino-3,6-bis(2-piperidinoethylsulfonyl)benzene (**X**) in up to 70% yield (Scheme 2).

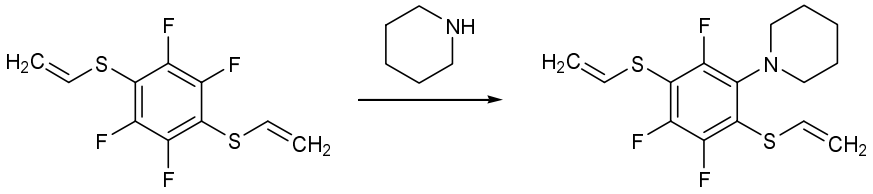
The reaction of 1,2,4,5-tetrafluoro-3,6-bis(vinylsulfanyl)benzene (**XI**) with 4 equiv of piperidine in DMF at 100°C gave product of replacement of only one fluorine atom, 2,4,5-trifluoro-1-piperidino-3,6-bis-(vinylsulfanyl)benzene (**XII**, yield 34%; Scheme 3). Disubstituted products **IV**–**VI** were obtained from bissulfone **I** under analogous conditions, but at a lower

**Scheme 2.**




II X

**Scheme 3.**



**XI** **XII**

temperature (55–60°C). These data indicate enhanced reactivity of 1,2,4,5-tetrafluoro-3,6-bis(vinylsulfonyl)-benzene (**I**) as compared to bis-sulfide **XI** and hexafluorobenzene [9] in nucleophilic substitution processes. Obviously, the reason is activating effect of the electron-acceptor sulfonyl groups, which is consistent with the data of Rodionov *et al*. [10] who studied the effect of sulfur-containing substituents in polyfluorinated benzene ring on the rate of fluorine replacement by various nucleophiles, including piperidine.

Compounds **II**–**X** are light yellow high-melting crystalline substances. Their structure was proved by the IR and $^1$H, $^{13}$C, and $^{19}$F NMR spectra and elemental analyses.

## EXPERIMENTAL

The IR spectra were obtained on a Bruker IFS-25 spectrometer from samples dispersed in mineral oil or pelleted with KBr. The $^1$H and $^{13}$C NMR spectra were recorded on a Bruker DPX-400 instrument (400 MHz for $^1$H) in $CDCl_3$. The chemical shifts were measured relative to HMDS ($^1$H and $^{13}$C), $CFCl_3$ ($^{19}$F), or $CH_3NO_2$ ($^{15}$N). The GC–MS data were obtained using an HP 5971A mass-selective detector (electron impact, 70 eV) coupled with a gas chromatograph.

**1,2,4,5-Tetrafluoro-3,6-bis(2-piperidinoethylsulfonyl)benzene (II).** A solution of 1 g of 1,2,4,5-tetrafluoro-3,6-bis(vinylsulfonyl)benzene in 17 ml of DMF was heated to 55°C, a solution of 0.5 g of piperidine in 3 ml of DMF was added, and the mixture was stirred for 6 h at 55–60°C. The mixture was treated with water and extracted with chloroform. The extract was washed with water and dried over $MgSO_4$. The solvent was removed to obtain 1.1 g of a crystalline substance which was washed with ethanol and ether and recrystallized from chloroform. Yield 0.61 g (40%), light yellow crystals, mp 176–177°C (from chloroform). IR spectrum, ν, cm$^{-1}$: 1141, 1339 ($SO_2$). $^1$H NMR spectrum ($CDCl_3$), δ, ppm: 1.20 br.m and 1.30 br.m (4H each, $CH_2$, piperidine), 2.25 br.m (4H, $NCH_2$, piperidine), 2.86 t (4H, $SO_2CH_2CH_2N$, $^3J$ = 5.92 Hz), 3.48 t (4H, $CH_2SO_2$, $^3J$ = 5.92 Hz). $^{13}$C NMR spectrum, $\delta_C$, ppm: 23.72 ($C^4$, piperidine), 25.68 ($C^3$, piperidine), 52.40 ($SO_2CH_2CH_2N$), 54.30 ($C^2$, piperidine), 54.91 ($CH_2SO_2$), 125.22 ($C^6$, $C^3$, arom.), 144.59 d.d ($C^1$, $C^2$, $C^4$, $C^5$, arom., $^1J_{CF}$ = 267.6, $^2J_{CF}$ = 12.27 Hz). $^{19}$F NMR spectrum: $\delta_F$ –135.31 ppm, s. Found, %: C 47.91; H 6.23; F 14.91; N 6.12; S 12.98. $C_{20}H_{28}F_4N_2O_4S_2$. Calculated, %: C 47.98; H 5.64; F 15.18; N 5.60; S 12.81.

**2,4,5-Trifluoro-1-piperidino-3,6-bis(2-piperidinoethylsulfonyl)benzene (III)** was synthesized in a similar way, but using 4 equiv of piperidine. Yield 47%, mp 141–142°C (from ethanol). IR spectrum, ν, cm$^{-1}$: 1140, 1327 ($SO_2$). $^1$H NMR spectrum ($CDCl_3$), δ, ppm: 1.17 m (4H, $C^4H_2$, piperidine–$CH_2$), 1.33 m [8H, $C^3H_2$, $C^5H_2$, piperidine–$CH_2$), 2.25 m and 2.30 m (4H, $NCH_2$, piperidine–$CH_2$), 1.69 m (6H, $CH_2$, piperidine–$C_{arom}$), 3.14 m and 3.07 m (4H, $NCH_2$, piperidine–$C_{arom}$), 2.86 t (2H, $H_{B'}$, $^3J$ = 6 Hz), 3.47 t (2H, $H_{A'}$), 2.80 t (2H, $H_B$), 3.70 t (2H, $H_A$). $^{13}$C NMR spectrum, $\delta_C$, ppm: 23.73 ($C^2$, $C^6$, piperidine–$CH_2$), 23.82 ($C^2$, $C^6$, piperidine–$C_{arom}$), 25.74 and 25.67 ($C^3$, $C^5$, piperidine–$CH_2$), 26.12 ($C^3$, $C^5$, piperidine–$C_{arom}$), 52.40 ($C^B$), 52.32 ($C^{B'}$), 52.86 ($C^2$, $C^6$, piperidine–$C_{arom}$), 54.42 and 54.25 ($C^2$, $C^6$, piperidine–$CH_2$), 54.54 ($C^A$), 54.20 ($C^{A'}$), 155 d ($C^1$, arom., $^1J_{CF}$ = 263.39 Hz), 145.90 d.d ($C^4$, arom., $^1J_{CF}$ = 266.36, $^2J_{CF}$ = 16.2 Hz), 146.80 d.d ($C^5$, arom., $^1J_{CF}$ = 263.38, $^2J_{CF}$ = 18.0 Hz), 136.67 d.d ($C^3$, arom., $^2J_{CF}$ = 16.3, $^3J_{CF}$ = 4.8 Hz), 133.38 ($C^2$, arom.), 124.55 d.d ($C^6$, arom., $^2J_{CF}$ = 18.4, $^3J_{CF}$ = 13.0 Hz). $^{19}$F NMR spectrum, $\delta_F$, ppm: –118.36 d (2-F, $^5J_{FF}$ = 14.3 Hz), –131.48 d (4-F, $^3J_{FF}$ = 23.5 Hz), –135.43 d.d (5-F). $^{15}$N NMR spectrum, $\delta_N$, ppm: –330.6, –331.4 [$CH_2N(CH_2)_2$]. Found, %: C 52.84; H 6.72; F 9.24; N 7.55; S 11.52. $C_{25}H_{38}F_3N_3O_4S_2$. Calculated, %: C 53.07; H 6.77; F 10.07; N 7.42; S 11.33.

**1,4-Difluoro-2,5-dipiperidino-3,6-bis(2-piperidinoethylsulfonyl)benzene (IV).** A solution of 0.8 g of compound **I** in 25 ml of ethanol was heated to 55–60°C, a solution of 1.2 g of piperidine in 5 ml of ethanol was added, and the mixture was stirred for 6 h at that temperature. The precipitate was filtered off and

washed with ethanol and diethyl ether. Yield 1 g (65%), light yellow crystals, mp 167–168°C. IR spectrum, ν, $cm^{-1}$: 1133, 1320 ($SO_2$). $^1H$ NMR spectrum ($CDCl_3$), δ, ppm: 1.20 br.m (4H, $C^4H_2$, piperidine–$CH_2$), 1.73 br.m [8H, $C^3H_2$, $C^5H_2$, piperidine–$CH_2$), 2.25 and 2.32 br.m (8H, $C^2H_2$, $C^6H_2$, piperidine–$CH_2$), 2.82 t (4H, $SO_2CH_2CH_2N$), 3.07 m and 3.15 m (8H, $C^2H_2$, $C^6H_2$, piperidine–$C_{arom}$), 3.69 t (4H, $CH_2SO_2$). $^{13}C$ NMR spectrum, $\delta_C$, ppm: 23.81 ($C^4$, piperidine–$CH_2$), 23.91 ($C^4$, piperidine–$C_{arom}$), 25.73 ($C^3$, $C^5$, piperidine–$CH_2$), 25.99 ($C^3$, $C^5$, piperidine–$C_{arom}$), 52.17 ($SO_2CH_2CH_2N$), 52.62 ($C^2$, $C^6$, piperidine), 54.40 ($SO_2CH_2$), 132.37 d.d ($C^3$, $C^6$, arom.), 139.11 d.d ($C^1$, $C^4$, arom.), 155.19 ($C^2$, arom.), 157.84 ($C^5$, arom.). Found, %: C 57.09; H 7.71; F 6.94; N 9.17; S 10.71. $C_{30}H_{48}F_2N_4O_4S_2$. Calculated, %: C 57.11; H 7.67; F 6.02; N 8.81; S 10.16.

**1,4-Difluoro-2,5-bis(1-pyrrolidinyl)-3,6-bis[2-(1-pyrrolidinyl)ethylsulfonyl)benzene (V).** A solution of 1.4 g of compound **I** in 20 ml of DMF was heated to 55°C, and a solution of 1.2 g of pyrrolidine in 5 ml of DMF was added dropwise from a dropping funnel (the reaction was accompanied by a slight evolution of heat). The mixture was stirred for 6 h at 55–60°C and was left overnight. The precipitate was filtered off and washed with ethanol and diethyl ether. Yield 1.6 g (65.5%), light brown crystals, mp 191–192°C (decomp.). IR spectrum, ν, $cm^{-1}$: 1136, 1319 ($SO_2$). $^1H$ NMR spectrum (DMSO-$d_6$), δ, ppm: 1.54 m (8H, $C^3H_2$, $C^4H_2$, pyrrolidine–$CH_2$), 1.85 m [8H, $C^3H_2$, $C^4H_2$, pyrrolidine–$C_{arom}$), 2.36 m [8H, $C^2H_2$, $C^5H_2$, pyrrolidine–$CH_2$), 2.83 t (4H, $SO_2CH_2CH_2N$), 3.15 m (8H, $C^2H_2$, $C^5H_2$, pyrrolidine–$C_{arom}$), 3.66 t (4H, $CH_2SO_2$). $^{13}C$ NMR spectrum, $\delta_C$, ppm: 23.06 ($C^3$, $C^4$, pyrrolidine–$CH_2$), 25.48 ($C^3$, $C^4$, pyrrolidine–$C_{arom}$), 48.31 ($SO_2CH_2CH_2N$), 52.62 ($C^2$, $C^5$, pyrrolidine–$C_{arom}$), 52.99 ($C^2$, $C^5$, pyrrolidine–$CH_2$), 55.15 ($CH_2SO_2$). Found, %: C 53.60; H 7.06; F 6.85; N 9.78; S 11.03. $C_{26}H_{40}F_2N_4O_4S_2$. Calculated, %: C 54.33; H 7.01; F 6.61; N 9.75; S 11.16.

**1,4-Difluoro-2,5-dimorpholino-3,6-bis(2-morpholinoethylsulfonyl)benzene (VI).** A solution of 1 g of compound **I** in 20 ml of DMF was heated to 55°C, a solution of 1 g of morpholine in 5 ml of DMF was added, and the mixture was stirred for 6 h at 55–60°C. The precipitate was filtered off and washed with ethanol and diethyl ether. Yield 0.7 g (37%), light yellow crystals, mp 273°C (decomp.). IR spectrum, ν, $cm^{-1}$: 1139, 1320 ($SO_2$). $^1H$ NMR spectrum ($CDCl_3$), δ, ppm: 2.43 br.t (8H, $NCH_2$, morpholine–$CH_2$), 2.93 br.m and 3.43 br.m (4H each, $NCH_2$, morpholine–$C_{arom}$), 2.92 t (4H, $SO_2CH_2CH_2N$, $^3J$ = 6.8 Hz), 3.55 br.t (8H, $CH_2OCH_2$, morpholine–$CH_2$, $^3J$ = 4 Hz), 3.72 t (4H, $CH_2SO_2$), 3.84 br.m (8H, $CH_2OCH_2$, morpholine–$C_{arom}$). $^{13}C$ NMR spectrum, $\delta_C$, ppm: 51.58 ($SO_2CH_2CH_2N$), 51.80 ($CH_2NCH_2$, morpholine–$C_{arom}$), 53.48 ($CH_2NCH_2$, morpholine–$CH_2$), 54.66 ($SO_2CH_2$), 66.70 ($CH_2OCH_2$, morpholine–$CH_2$), 67.13 ($CH_2OCH_2$, morpholine–$C_{arom}$), 156.10 d.d ($C_{arom}$, $^1J_{CF}$ = 266.1, $^4J_{CF}$ = 3.45 Hz), 133.12 d.d ($C_{arom}$, $^2J_{CF} \approx {}^3J_{CF} \approx$ 7.7 Hz), 137.87 d.d ($C_{arom}$, $^2J_{CF}$ = 11.5, $^3J_{CF}$ = 6.9 Hz). $^{19}F$ NMR spectrum: $\delta_F$ –117.11 ppm, s. Found, %: C 48.57; H 6.38; F 5.43; N 9.00; S 9.36. $C_{26}H_{40}F_2N_4O_8S_2$. Calculated, %: C 48.89; H 6.31; F 5.95; N 8.77; S 10.04.

**1,4-Difluoro-2,5-dimorpholino-3,6-bis(2-piperidinoethylsulfonyl)benzene (X).** A solution of 0.4 g of compound **II** in 8 ml of DMF was heated to 55°C, a solution of 0.21 g of morpholine in 4 ml of DMF was added, and the mixture was stirred for 6 h at 55–60°C and left overnight. It was then diluted with 25 ml of water and extracted with chloroform, the extract was washed with water and dried over $MgSO_4$, and the solvent was removed to obtain 0.8 g of a solid substance which was recrystallized from hot ethanol. Yield 0.35 g (69%), light yellow crystals, mp 208–210°C (decomp.). IR spectrum, ν, $cm^{-1}$: 1137, 1324 ($SO_2$). $^1H$ NMR spectrum ($CDCl_3$), δ, ppm: 1.68 br.m and 1.8 br.m (6H each, $CH_2$, piperidine), 2.42 br.m (8H, $CH_2NCH_2$), 2.87 t (4H, $SO_2CH_2CH_2N$), 3.06 br.m and 3.15 br.m (4H each, $NCH_2$, morpholine), 3.55 t (4H, $SO_2CH_2$), 3.75 m (8H, $CH_2OCH_2$). $^{13}C$ NMR spectrum, δ, ppm: 23.61 ($C^4$, piperidine), 26.00 ($C^3$, $C^5$, piperidine), 52.60 ($SO_2CH_2CH_2N$), 53.31 ($C^2$, $C^6$, piperidine), 54.36 ($SO_2CH_2$), 66.62 ($CH_2OCH_2$), 51.61 ($CH_2NCH_2$, morpholine), 132.25 d.d ($C^3$, $C^6$, arom.), 137.40 d.d ($C^2$, $C^5$, arom.), 157.59 d.d and 154.95 d.d (C–F). $^{19}F$ NMR spectrum: $\delta_F$ –117.86 ppm. Found, %: C 52.98; H 7.41; F 5.93; N 9.58; S 10.68. $C_{28}H_{44}F_2N_4O_6S_2$. Calculated, %: C 52.97; H 6.98; F 5.98; N 8.82; S 10.10.

**2,4,5-Trifluoro-1-piperidino-3,6-bis(vinylsulfanyl)benzene (XII).** A solution of 1.53 g of piperidine in 5 ml of DMF was added to a solution of 1.2 g of 1,2,4,5-tetrafluoro-3,6-bis(vinylsulfanyl)benzene (**XI**) in 15 ml of DMF. The mixture was heated for 10 h at 100°C, diluted with 25 ml of water, and extracted with diethyl ether. The extract was washed with water, dried over $MgSO_4$, and evaporated. The residue, 0.8 g, was a dark brown liquid containing (according to the GC–MS data) 51.4% of compound **XII**, 12.8% of 6-(3-butenylsulfanyl)-1-dimethylamino-2,4,5-tri-

fluoro-3-vinylsulfanylbenzene [11], 6% of 6-dimethylamino-1,2,4,5-tetrafluoro-3-vinylsulfanylbenzene [12], and 26% of initial compound **XI**. IR spectrum of **XII**: ν(SCH=$CH_2$) 1590 $cm^{-1}$. $^1$H NMR spectrum ($CDCl_3$), δ, ppm: 1.55 br.m (2H, $C^4H_2$, piperidine), 1.64 m (4H, $C^3H_2$, $C^5H_2$, piperidine), 3.01 m (4H, $CH_2NCH_2$), 5.29 d and 5.32 d (2H, $CH_2$=), 6.33 d.d (1H, 3-SCH=, $^3J_{cis}$ = 9.54, $^3J_{trans}$ = 15.21 Hz), 5.30 d and 5.31 d (2H, $CH_2$=), 6.37 d.d (1H, SCH=, 6-SCH=, $^3J_{cis}$ = 9.67, $^3J_{trans}$ = 16.25 Hz).

**1,4-Difluoro-2,5-dipiperidino-3,6-bis(2-piperidinoethylsulfonyl)benzene hydrochloride (VII).** Gaseous hydrogen chloride was passed over a period of 30 min through a solution of 0.5 g of compound **IV** in 5 ml of chloroform at room temperature. The precipitate was filtered off and washed with chloroform and diethyl ether. Yield 0.5 g (82%), light yellow finely crystalline substance, mp 263–265°C (decomp.). Found, %: C 47.58; H 6.97; Cl 17.16; F 4.33; N 7.09; S 8.57. $C_{30}H_{49}ClF_2N_4O_4S_2$. Calculated, %: C 48.30; H 6.41; Cl 16.46; F 4.92; N 7.27; S 8.32.

**1,4-Difluoro-2,5-bis(1-pyrrolidinyl)-3,6-bis-[2-(1-pyrrolidinyl)ethylsulfonyl)benzene hydroperchlorate (VIII).** To a solution of 0.1 g of compound **V** in 3 ml of chloroform we added under stirring 3 ml of 30% $HClO_4$. After 3 h, the precipitate was filtered off and washed with ethanol and diethyl ether. Yield 0.1 g (74%), mp 239–240°C (decomp.). Found, %: C 40.95; H 5.46; Cl 15.88; F 5.28; N 7.39; S 8.75. $C_{26}H_{41}ClF_2N_4O_8S_2$. Calculated, %: C 41.64; H 5.31; Cl 16.30; F 4.88; N 7.19; S 8.23.

**1,4-Difluoro-2,5-dipiperidino-3,6-bis(2-piperidinoethylsulfonyl)benzene hydroperchlorate (IX)** was obtained in a similar way. Yield 77%, mp 250°C (decomp.). Found, %: C 43.96; H 5.38; Cl 14.88; F 4.03; N 6.25; S 7.32. $C_{30}H_{49}ClF_2N_4O_8S_2$. Calculated, %: C 44.60; H 5.91; Cl 15.20; F 4.55; N 6.71; S 7.68.

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