Table II. Pharmacological Screening Results of *N*-Alkylformamidino-*N'*-arylthiocarbamide Hydrochlorides

compd no.	thyroid radioactivity[a] total ^{131}I uptake	thyroid radioactivity[a] PB^{131}I	inorganic ^{131}I[a]	approx estimated activity in rats[b]
control	112 345 ± 42	98 378 ± 36	7936 ± 12	
thiouracil	42 976 ± 18	35 421 ± 16	5448 ± 09	1.00
1	41 212 ± 21	33 886 ± 17	6549 ± 13	1.01
2	35 623 ± 35	26 429 ± 15	7215 ± 11	1.20
3	36 376 ± 18	29 648 ± 03	6542 ± 16	1.18
4	21 994 ± 31	15 348 ± 19	6301 ± 07	1.95
5	30 189 ± 27	24 575 ± 13	5641 ± 11	1.42
6	38 793 ± 24	31 647 ± 21	6728 ± 07	1.10
7	35 117 ± 22	29 176 ± 19	5112 ± 11	1.22
8	28 019 ± 23	19 429 ± 13	7755 ± 13	1.53
9	49 647 ± 32	43 305 ± 29	5991 ± 05	0.86
10	29 878 ± 17	25 429 ± 16	3908 ± 12	1.43
11	30 677 ± 18	22 695 ± 14	7404 ± 08	1.40
12	29 039 ± 28	23 115 ± 13	5885 ± 11	1.47
13	28 453 ± 21	22 524 ± 13	5809 ± 09	1.51
14	20 967 ± 14	14 789 ± 18	5910 ± 12	2.04
15	32 373 ± 21	25 721 ± 10	6209 ± 08	1.32
16	28 379 ± 25	21 429 ± 15	6912 ± 15	1.51
17	30 827 ± 18	24 331 ± 17	6221 ± 08	1.42
18	32 689 ± 19	26 458 ± 21	6015 ± 12	1.31
19	40 399 ± 23	34 217 ± 16	5910 ± 16	1.06
20	28 087 ± 14	22 315 ± 14	5749 ± 15	1.53
21	31 378 ± 13	24 243 ± 20	6989 ± 11	1.36
22	31 287 ± 22	24 223 ± 19	6832 ± 12	1.37
23	20 058 ± 21	13 739 ± 12	6221 ± 09	2.14
24	27 422 ± 24	20 351 ± 21	7017 ± 14	1.56
25	23 543 ± 17	16 198 ± 14	7119 ± 08	1.82
26	29 813 ± 27	22 325 ± 16	6301 ± 11	1.43
27	42 116 ± 19	35 983 ± 15	6432 ± 10	1.02
28	35 468 ± 25	28 213 ± 17	7012 ± 10	1.19
29	33 343 ± 27	26 462 ± 18	6677 ± 06	1.28
30	30 773 ± 15	23 056 ± 12	7288 ± 09	1.39

[a] Units are disintegrations/min. ± Standard error.
[b] Thiouracil = 1.00.

Table I and their pharmacological screening results are described in Table II.

Pharmacological Screening (12). Male Holtzman rats (100–125 g) were maintained on a low-iodide diet for 3 days and then divided into groups consisting of four rats in each group. The animal in each group received an intraperitoneal injection of 1 mL of either a blank (0.9% NaCl), thiouracil, or one of the test compounds. One hour later, 1 μCi of Na ^{131}I (Career free) was injected intraperitoneally. Three hours after the injection of ^{131}I, the animals were sacrificed and the thyroids were removed. The whole lobes were placed in ground-glass homogenizing tubes and counted in a Nuclear-Chicago well scintillation counter to determine total thyroid uptake. The whole lobes were then homogenized in 1 mL of 0.05 M barbital buffer (pH 8.6) containing 1.0×10^{-5} M thiouracil. One milliliter of cold 20% TCA was added and the homogenate was centrifuged. The precipitate was washed twice with 1.0 mL of cold 10% TCA. The original supernatant and the two washes were combined and the radioactivity was determined. The ^{131}I in this fraction indicated the concentration of inorganic ^{131}I or TCA-soluble ^{131}I. The washed precipitate was counted in the homogenizing tube. The radioactivity in this fraction indicated the PB ^{131}I or the TCA-precipitable ^{131}I. The counts were all corrected for counting efficiency and are expressed as disintegrations per minute.

All compounds were dissolved in saline for injection. Thiouracil was dissolved with heating to 55 °C. All compounds were assayed at concentrations equimolar to 0.5 mg of thiouracil (3.9 μmol) and the biological effect was noted. Table II summarizes the observations made with compounds **1–30**.

The pharmacological results show that the compounds having chlorine in aryl nucleus have enhanced activity. Furthermore the compounds with isopropyl and *tert*-butyl groups are having appreciable antithyroidal activity. It is also evident from the data that the ratio of PBI level has decreased and inorganic iodine level has proportionately increased.

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Preparation and Properties of 2-Fluoro-2,2-dinitroethyl Pentafluorothioacetate

E. F. Witucki* and M. B. Frankel

Rocketdyne, A Division of Rockwell International, Canoga Park, California 91304

The preparation and properties of 2,2,2-fluorodinitroethyl pentafluorothioacetate is reported.

There has been considerable work done on the synthesis of aliphatic sulfur pentafluoride compounds (*1–3*). These are an interesting class of compounds because of their high fluorine content, which imparts high density and good physical properties to the molecule. However, there has been no report of such compounds containing energetic nitro groups. Since aliphatic derivatives of sulfur pentafluoride are currently of interest as potential high-energy compounds, it was pertinent to determine the feasibility of preparing aliphatic compounds containing both the SF_5 and NO_2 moieties.

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In the review of the literature of SF_5 compounds, the most attractive starting material for this work appeared to be pentafluorothioacetyl chloride (I), which has been prepared by the addition of SF_5Cl to ketene (*3*).

$$SF_5Cl + CH_2{=}C{=}O \rightarrow \underset{\text{I}}{SF_5CH_2COCl}$$

Direct esterification of I with 2,2,2-fluorodinitroethanol gave the target compound of 2,2,2-fluorodinitroethyl pentafluorothioacetate (II).

$$\text{I} + HOCH_2C(NO_2)_2F \rightarrow \underset{\text{II}}{SF_5CH_2CO_2CH_2C(NO_2)_2F}$$

Compound II represents the first SF_5 polynitro compound prepared to date. Its properties, as summarized in the Experimental Section, show that it is a very dense, thermally stable liquid.

Experimental Section

To a mixture of 0.8 g (4 mmol) of pentafluorothioacetyl chloride (*3*) and 0.8 g (5 mmol) of 2,2,2-fluorodinitroethanol (*4*) in 15 mL of dry chloroform was added 0.7 g (5 mmol) of freshly sublimed aluminum chloride. The reaction mixture was refluxed for 16 h, cooled, and washed with dilute hydrochloric acid and water. The chloroform solution was concentrated and the product distilled to give 0.82 g (64%) of colorless liquid: bp 66 °C (0.1 mm), $n^{23}{}_D$ 1.4155, d^{23} 1.697. The infrared spectrum showed the following characteristic peaks: 3400 (C–H), 5650 (C=O), 6250 (C–NO_2), 1100–1200 nm (S–F).

Anal. Calcd for $C_4H_4F_6N_2O_6S$: C, 14.91; H, 1.25; N, 8.7. Found: C, 15.57; H, 1.22; N, 8.8.

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