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*Studies on synthesis, structure and properties of
2-dibenzofuransulfinic acid and its derivatives*

Badania nad syntezą, strukturą i właściwościami kwasu
2-dibenzofuranosulfinowego i jego pochodnych

1. INTRODUCTION

Intensive studies on chemistry of arylsulfinic acids were carried out by Janczewski and co-workers. The research covered such arenes as naphthalene [1,2], acenaphthene [3], diphenyl [4] and phenanthrene [5]. The motivation of interest in chemistry of 2-dibenzofuransulfinic acids was gained from experiments on the influence of position isomerism on optical properties of compounds with sulfinyl centers of asymmetry in dibenzofuran group. The stereochemical problems to be investigated required a description of preparation of dibenzofurysulfinylacetic acids, and this was connected with the examination of reduction processes of dibenzofuransulfonyl chlorides to suitable mercaptans. Dibenzofuransulfinic acids might be the main intermediates in reduction of sulfochlorides. Up to now among isomeric monodibenzofuransulfinic acids only 4-dibenzofuransulfinic acid [6,7] has been described.

It is worth noting that 2-dibenzofuransulfinic acid was obtained at first in its sodium salt by Gilman and co-workers [8] but free acid had not been isolated.

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In the literature no information was given concerning properties of this compound. The subject of this paper are studies on synthesis, structure and physicochemical properties of 2-dibenzofuransulfinic acid. The starting material for synthesis of this acid was chloride of 2-dibenzofuransulfonic acid [8] which, during reduction by means of zinc dust, results finally in suitable sulfinic acid (1). Conducting the reducing process in ethanolic solution instead of aqueous medium allows to obtain sodium salt of 2-dibenzofuransulfinic acid in very good – 97% yield, that is about 30% higher than that obtained by Gilman. 2-Sulfinic acid (1) separated from its sodium salt (1a) turned out to be unstable compound quickly changing in atmospheric conditions. However, its salts: sodium (1a), benzylisothiuronium (1b) and methylester (2) are stable.

It should be stressed that sodium salt of 2-dibenzofuransulfinic acid readily reacts with alkylhalogens, arylalkylhalogens, α -halogenketons and also with chloroderivatives of benzene possessing NO_2 groups in the ortho- and para-positions.

As a rule in this type of conversions compounds of sulfone nature were obtained. Methyl (3), ethyl (4), benzyl (5), *p*-nitrobenzyl (6), *p*-bromophenacyl (7), and 2,4-dinitrophenyl (8) sulfones are fine crystallizing, stable compounds which may be used for characterization and identification of isomeric dibenzofuransulfinic acids.

It should be stated that sodium salt (1a) easily enters in reaction with halogenocarboxylic acids resulting in suitable acids. In this way two acids were obtained: 2-dibenzofurysulfonylacetic acid (9) and β -(2-dibenzofurysulfonyl)propionic acid (15). The first one turned out to be identical with acid obtained earlier by oxidation of 2-dibenzofurysulfinylacetic acid [9]. In further studies experiments were carried out on addition of 2-dibenzofuransulfinic acid to α,β -unsaturated compounds.

It was found that acid (1) readily reacts with *p*-benzoquinone resulting in 2-(2',5'-dihydroxyphenylsulfonyl)dibenzofuran (10) which in methylation and benzylation reactions created suitable dimethyl- (11) and dibenzoyl-derivatives (12).

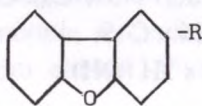
Sulfinic acid (1) also readily reacts with vinyl cyanide resulting in very good yield of β -cyanoethylsulfonyldibenzofuran (13). In hydrolysis this compound (13) became converted into β -(2-dibenzofurysulfonyl)propionic acid (15). The latter was also obtained by coupling 2-mercaptodibenzofuran [10] with sodium salt of β -chloropropionic acid, and resulting mercaptoacid (14) was finally oxidized.

The mixture of β -(2-dibenzofurylsulfonyl)propionic acids obtained in various ways did not show depression at melting point. This behaviour indicated that 2-dibenzofuransulfinic acid was attached to β carbon atom in vinyl cyanide. Further, it was confirmed that 2-dibenzofuransulfinic acid (1) is also readily attached to ω -nitrostyrene as well as to benzylidene acetone forming 2-(1'-phenyl-2'-nitroethylsulfonyl)dibenzofuran (16) and 2-(1'-phenyl-1'-acetyl methylsulfonyl)dibenzofuran (17), respectively. These two sulfones are fine crystallizing compounds possessing comparatively high and sharp melting points, and therefore they may be used for identification of arylsulfinic acids. The structure of synthesized compounds was determined by elemental analysis, IR and $^1\text{H-NMR}$ spectroscopies.

Since dibenzofuran was discovered in alkaloids morphine group and in the products isolated from mosses e.g. in usnic acid, the probability is that some of the compounds from the presented group may possess interesting pharmacological properties. Further comprehensive studies concerning the new dibenzofuran-sulfinic acids will be carried out.

2. EXPERIMENTAL

IR spectra were recorded in KBr discs with a FT 1725X Perkin-Elmer spectrophotometer. $^1\text{H-NMR}$ spectra were determined using BS 567A Tesla 100MHz spectrophotometer with TMS as an internal standard.



- | | |
|---|--|
| 1. $\text{R} = \text{SO}_2\text{H}$ | 10. $\text{R} = \text{SO}_2 \text{C}_6\text{H}_3(\text{OH})_2$ |
| 2. $\text{R} = \text{SO} \text{OCH}_3$ | 11. $\text{R} = \text{SO}_2 \text{C}_6\text{H}_3(\text{OCH}_3)_2$ |
| 3. $\text{R} = \text{SO}_2 \text{CH}_3$ | 12. $\text{R} = \text{SO}_2 \text{C}_6\text{H}_3(\text{O} \text{CO} \text{C}_6\text{H}_5)_2$ |
| 4. $\text{R} = \text{SO}_2 \text{C}_2\text{H}_5$ | 13. $\text{R} = \text{SO}_2 \text{CH}_2 \text{CH}_2 \text{CN}$ |
| 5. $\text{R} = \text{SO}_2 \text{CH}_2 \text{C}_6\text{H}_5$ | 14. $\text{R} = \text{S} \text{CH}_2 \text{CH}_2 \text{COOH}$ |
| 6. $\text{R} = \text{SO}_2 \text{CH}_2 \text{C}_6\text{H}_4\text{NO}_2$ | 15. $\text{R} = \text{SO}_2 \text{CH}_2 \text{CH}_2 \text{COOH}$ |
| 7. $\text{R} = \text{SO}_2 \text{CH}_2 \text{CO} \text{C}_6\text{H}_4\text{Br}$ | 16. $\text{R} = \text{SO}_2 \text{CH}(\text{C}_6\text{H}_5) \text{CH}_2 \text{NO}_2$ |
| 8. $\text{R} = \text{SO}_2 \text{C}_6\text{H}_3(\text{NO}_2)_2$ | 17. $\text{R} = \text{SO}_2 \text{CH}(\text{C}_6\text{H}_5) \text{CH}_2 \text{CO} \text{CH}_3$ |
| 9. $\text{R} = \text{SO}_2 \text{CH}_2 \text{COOH}$ | |

1. 2-Dibenzofuransulfinic acid

Method A. Sodium salt of 2-dibenzofuransulfinic acid

A sample of 7.99g (0.03 mole) of 2-dibenzofuransulfonyl chloride [8] was added partially to a suspension of 12g zinc dust in 18cm³ ethanol and 2.5cm³ of water acidified with few drops of conc. HCl during vigorous stirring. When the temperature of the reaction achieved 60°C, 20cm³ ethanol was added and was refluxed for 0.5h. The solution was allowed to stand at room temperature. The resulting precipitate was filtered off and suspended in 100cm³ of water. Then the reaction mixture was alkalized with 5cm³ 10% NaOH solution and solid NaCO₃. The product of sodium salt was filtered off and crystallized from water. Plates. Yield 7.4g (97%).

The solution of 2.54g (0.01 mole) of sodium salt of 2-dibenzofuransulfinic acid in 100cm³ of water was acidified with dilute (1:1) hydrochloric acid. After separation, the precipitate was crystallized from ethanol and dried under reduced pressure. Needles, m.p. 160–162°C (with decomposition). Yield 1.7g (73%). In an air atmosphere it is blackened.

Analysis:

For C₁₂H₈O₃S (232.27) Calcd.: 62.00% C, 3.47% H;

Found: 61.45% C, 3.32% H.

IR (cm⁻¹): 3072 ν C_{Ar}-H; 867,822 δ C_{Ar}-H (subst. 1,2,4); 754 δ C_{Ar}-H (subst. 1,2); 1627,1588,1443 ν C_{Ar}=C_{Ar}; 1247 ν C_{Ar}-O; 2851 ν O-H; 1079 ν S=O; 626 ν C-S.

¹H-NMR (ppm, DMSO-d₆): 9.92 s 1H (OH).

Method B. Benzylisothiuronium salt of 2-dibenzofuransulfinic acid

To a solution of 3.81g (0.015 mole) of sodium salt of 2-dibenzofuransulfinic acid in 80cm³ of water, 3.44g (0.017 mole) of chlorohydride of S-benzylisothiurea in 45cm³ of water was added. The resulting mixture was mechanically stirred for 1h. A finely crystalline precipitate was filtered off and crystallized from methanol. Plates, m.p. 181–182 °C (with decomposition). Yield 4.8g (80%).

Analysis:For $C_{20}H_{18}N_2O_3S_2$ (398.49) Calcd.: 7.03% N;

Found: 6.76% N.

2. Methyl ester of 2-dibenzofuransulfinic acid

A sample of 3g (0.012 mole) of 2-dibenzofuransulfinic acid suspended in 20cm³ of diethyl ether was treated with an ethereal solution of diazomethane until the mixture became permanently coloured. Then the solution was filtered and after removing the solvent the residue was crystallized from heptane. Prisms, m.p. 64.5–66 °C. Yield 1.8g (61%).

Analysis:For $C_{13}H_{10}O_3S$ (246.27) Calcd.: 63.39% C, 4.09% H;

Found: 63.51% C, 4.25% H.

IR (cm⁻¹): 1466, 1368 ν C–H (CH₃); 1129 ν S=O; 730, 699 ν S–O.¹H-NMR (ppm, CDCl₃): 3.50 s 3H (CH₃).**3. 2-Methylsulfonyldibenzofuran**

To a solution of 2g (0.008 mole) of sodium salt of acid (1) in 20cm³ of 48% ethanol, 2.4g (0.016 mole) of methyl iodide in 10cm³ of ethanol was added gradually. The resulting mixture was refluxed for 2h. The precipitate was isolated and crystallized from ethanol. Plates, m.p. 184.5–185 °C. Yield 1.1g (56%).

Analysis:For $C_{13}H_{10}O_3S$ (246.29) Calcd.: 63.39% C, 4.09% H;

Found: 63.60% C, 4.11% H.

IR (cm⁻¹): 2927 ν_{as} CH₃; 1422 δ_{as} CH₃; 1325 δ_s CH₃; 1296 ν_{as} SO₂; 1142 ν_s SO₂.¹H-NMR (ppm, CDCl₃): 3.15 s 3H (CH₃).

4. 2-Ethylsulfonyldibenzofuran

To the solution of 2.5g (0.01 mole) of sodium salt of acid (1) in 20cm³ of 48% ethanol solution, 5.1g (0.02 mole) of ethyl iodide in 15cm³ of ethanol was added dropwise and the mixture was refluxed for 2h. After separation, the precipitate was crystallized from 48% ethanol. Plates, m.p. 138.5–140 °C. Yield 2.2g (85%).

Analysis:

For C₁₄H₁₂O₃S (260.30) Calcd.: 64.58% C, 4.64% H;

Found: 64.70% C, 4.85% H.

IR (cm⁻¹): 2942 ν_{as} CH₃; 2875 ν_s CH₃; 1465 δ CH₂ and CH₃; 1304 ν_{as} SO₂; 1142 ν_s SO₂.

¹H-NMR (ppm, CDCl₃): 1.32 t, J = 7.4Hz 3H (CH₃); 3.22 q, J = 7.4Hz 2H (CH₂).

5. 2-Benzylsulfonyldibenzofuran

To the solution of 1.5g (0.006 mole) of sodium salt of acid (1) in 20cm³ of 30% ethanol solution, 1.6g (0.012 mole) of benzyl chloride in 5cm³ of ethanol was added dropwise. The obtained solution was then heated on a steam bath for 1.5h. The product was filtered off and crystallized from ethanol. Needles, m.p. 205–207 °C. Yield 1.4g (73%).

Analysis:

For C₁₉H₁₄O₃S (322.36) Calcd.: 70.78% C, 4.37% H;

Found: 70.66% C, 4.29% H.

IR (cm⁻¹): 698 δ C_{Ar}-H (subst. 1); 2927 ν CH₂; 1422 δ CH₂; 1306 ν_{as} SO₂; 1157 ν_s SO₂.

¹H-NMR (ppm, CDCl₃): 4.39 s 2H (CH₂); 7.03–7.33 m 5H (C₆H₅).

6. 2-(4'-nitrobenzylsulfonyl)dibenzofuran

To the warm solution of 1.5g (0.006 mole) of sodium salt of acid (1) in 30cm³ of ethanol, 1.3g (0.006 mole) of *p*-nitrobenzyl bromide in 30cm³ of etha-

nol was gradually added. The obtained mixture was refluxed for 2h. The product was filtered off, and after washing with water, it was crystallized from glacial acetic acid. Needles, m.p. 234–236 °C. Yield 1.5g (68%).

Analysis:

For $C_{19}H_{13}NO_5S$ (367.36) Calcd.: 3.81% N;

Found: 3.79% N.

IR (cm^{-1}): 2943 v_{as} CH_2 ; 2851 v_s CH_2 ; 1517 v_{as} NO_2 ; 1347 v_s NO_2 ;
1303 v_{as} SO_2 ; 1139 v_s SO_2 .

7. 2-(4'-bromophenacetyl)sulfonyl)dibenzofuran

A sample of 1g (0.004 mole) of sodium salt of acid (1) was dissolved in 25cm³ ethanol and boiled. Further, 1.24g (0.004 mole) of *p*-bromophenacetyl bromide in 10cm³ of ethanol was gradually added. The resulting mixture was heated on a steam bath for 1.5h. The filtered precipitate after washing with water, was crystallized from glacial acetic acid. Many-sided lumps, m.p. 192–194 °C. Yield 1.2g (71%).

Analysis:

For $C_{20}H_{13}BrO_4S$ (429.28) Calcd.: 55.95% C, 3.05% H;

Found: 56.12% C, 3.31% H.

IR (cm^{-1}): 2937 v_{as} CH_2 ; 1466 δ CH_2 ; 1677 ν $C=O$; 1323 as SO_2 ;
1147 v_s SO_2 .

¹H-NMR (ppm, $CDCl_3$): 4.78 s 2H (CH_2); 7.33–7.49 m 4H (C_6H_4).

8. 2-(2',4'-Dinitrophenylsulfonyl)dibenzofuran

A sample of 2g (0.008 mole) of sodium salt of acid (1) in 40cm³ of 48% ethanol solution, after boiling, was treated with 1.6g (0.008 mole) of 2,4-dinitrochlorobenzene and the mixture was refluxed for 2 h. The resulting precipitate was filtered off and crystallized from a mixture of pyridine and ethanol (1:1.2 V/V). Bright green-yellow plates, m.p. 235–236 °C. Yield 1.8g (57%).

Analysis:

For $C_{18}H_{10}N_2O_7S$ (398.34) Calcd.: 7.03% N;

Found: 6.95% N.

IR (cm^{-1}): 1537 ν_{as} NO_2 ; 1352 ν_s NO_2 ; 1325 ν_{as} SO_2 ; 1150 ν_s SO_2 .

9. 2-Dibenzofurylsulfonylacetic acid

A sample of 5.1g (0.02 mole) of sodium salt of acid (1) was dissolved in 130cm³ of water and after neutralizing with solid $NaCO_3$, it was treated with 2g (0.02 mole) of chloroacetic acid in 30cm³ of water. The mixture was concentrated to 80cm³ and acidified with dilute (1:1) hydrochloric acid. The precipitate was separated and crystallized from 48% ethanol solution. Needles, m.p. 192–194 °C. Yield 3.6g (62%). Acid obtained in this way was identical with an oxidized 2-dibenzofurylsulfinylacetic acid [9].

¹H-NMR (ppm, DMSO- d_6): 4.62 s 2H (CH_2); 13.26 s 1H (OH).

10. 2-(2',5'-Dihydroxyphenylsulfonyl)dibenzofuran

To a solution of 9.28g (0.04 mole) of acid (1) in 100cm³ of ethanol, 4.32g (0.04 mole) of *p*-benzoquinone was partially added. Then the mixture was refluxed for 0.5h. The precipitate was filtered off and crystallized from 64% ethanol. Plates, m.p. 272–274 °C. Yield 8g (59%).

Analysis:

For $C_{18}H_{12}O_5S$ (340.34) Calcd.: 63.52% C, 3.47% H;

Found: 63.23% C, 3.60% H.

IR (cm^{-1}): 1369, 1199 δ OH and ν C–O (C–O–H); 1293 ν_{as} SO_2 ;

1138 ν_s SO_2 .

¹H-NMR (ppm, DMSO- d_6): 6.71–7.02 m 3H (C_6H_3); 9.46 s 1H (5'OH); 10.03 s 1H (2'OH).

11. 2-(2',5'-Dimethoxyphenylsulfonyl)dibenzofuran

A sample of 1.7g (0.005 mole) of compound (10) dissolved in 50cm³ of 5% NaOH solution was treated with 12.6g (0.1 mole) of dimethyl sulfate. The contents was stirred for 40min. The oily residue solidified soon, and it was crystallized from ethanol. Plates, m.p. 157–159 °C. Yield 1.6g (88%).

Analysis:

For C₂₀H₁₆O₅S (368.39) Calcd.: 65.20% C, 4.38% H;

Found: 65.18% C, 4.31% H.

IR (cm⁻¹): 2971 v_{as} CH₃; 2838 v_s CH₃; 1463 δ CH₃; 1308 v_{as} SO₂; 1150 v_s SO₂; 1038 v C–O (CH₃–O).

¹H-NMR (ppm, CDCl₃): 3.69 s 3H (5'OCH₃); 3.86 s 3H (2'OCH₃); 6.78–7.14 m 3H (C₆H₃).

12. 2-(2',5'-Dibenzoxyphenylsulfonyl)dibenzofuran

A sample of 1.7g (0.005 mole) of compound (10) dissolved in 50cm³ of 5% NaOH solution was treated dropwise with 1.54g (0.012 mole) of benzoil chloride during vigorous stirring. The oily residue after solidification was filtered off and crystallized from ethanol. Prisms, m.p. 183.5–184.5 °C. Yield 2.3g (84%).

Analysis:

For C₃₂H₂₀O₇S (548.54) Calcd.: 70.08% C, 3.67% H;

Found: 69.94% C, 3.61% H.

IR (cm⁻¹): 706 δ C_{Ar}–H (subst. 1); 1742 v C=O; 1317 v_{as} SO₂; 1153 v_s SO₂.

13. 2-(2'-cyanoethylsulfonyl)dibenzofuran

To solution of 2.32g (0.001 mole) of acid (1) in 50cm³ of methanol heated to 70°C, 1.5cm³ of vinyl cyanide in 5cm³ of methanol was added dropwise during vigorous stirring. The resulting mixture was heated under reflux for 4h. The separated precipitate was filtered off and crystallized from a mixture of acetone and water (6:1 V/V). Plates, m.p. 175.5–176.5 °C. Yield 2.5g (80%).

Analysis:

For $C_{15}H_{11}NO_3S$ (285.31) Calcd.: 63.14% C, 3.89% H, 4.94% N;

Found: 63.34% C, 4.13% H, 4.88% N.

IR (cm^{-1}): 2923 ν_{as} CH_2 ; 2853 ν_s CH_2 ; 1466 δ CH_2 ; 2254 ν $C\equiv N$; 1308 ν_{as} SO_2 ; 1143 ν_s SO_2 .

1H -NMR (ppm, $CDCl_3$): 2.87t, $J = 7.7Hz$ 2H (CH_2CN); 3.48t, $J = 7.7 Hz$ 2H (CH_2SO_2).

14. β -(2-Dibenzofurylmercapto)propionic acid

A sample of 6g (0.03 mole) of 2-mercaptodibenzofuran [10] dissolved in $30cm^3$ of 8% NaOH solution and neutralized with solid Na_2CO_3 was treated dropwise with 3.75g (0.035 mole) of β -chloropropionic acid in $40cm^3$ of water. The resulting solution was refluxed for 1h. The separated sodium salt of the obtained acid was filtered off, suspended in $200cm^3$ of water, and then acidified with dilute (1:1) HCl. The product was filtered and crystallized from benzene. Needles, m.p. 123.5–124.5C. Yield 5.3g (65%).

Analysis:

For $C_{15}H_{12}O_3S$ (272.31) Calcd.: 66.15% C, 4.44% H;

Found: 66.38% C, 4.52% H.

IR (cm^{-1}): 2937 ν_{as} CH_2 ; 1467 δ CH_2 ; 1714 ν $C=O$ (COOH); 941 δ OH (COOH); 657 ν C–S.

1H -NMR (ppm, $CDCl_3$): 2.62 t, $J = 7.5Hz$ 2H (CH_2CO); 3.15 t, $J = 7.5Hz$ 2H (CH_2S); 10.09 s 1H (OH).

15. β -(2-Dibenzofurylsulfonyl)propionic acid

Method A

To the solution of 2g (0.0073 mole) of acid (14) dissolved in $30cm^3$ of glacial acetic acid, $2cm^3$ of 30% H_2O_2 was added dropwise and the mixture was boiled for 15min. Then, further $1.5cm^3$ H_2O_2 was added and heating continued for 15min. The solution was concentrated to $10cm^3$ and forming precipitate after

cooling was separated and crystallized from 48% ethanol. Needles, m.p. 174–175 °C. Yield 0.95g (43%).

Method B

A sample of 1g (0.0035 mole) of compound (13) in 2cm³ of water was treated dropwise with 2cm³ of conc. sulfuric acid and 2cm³ of glacial acetic acid. The resulting solution was refluxed for 3h, then it was poured to 30cm³ of cold water. The precipitate was formed immediately and then separated and suspended in 30cm³ of water. The mixture was alkalized with solid Na₂CO₃ and filtered off after boiling with an active coal. The filtrate was then acidified with dilute (1:1) HCl. The forming acid was separated and crystallized from 48% ethanol. Needles, m.p. 174–175C. Yield 0.65 g (61%).

Method C

3.8g (0.015 mole) of sodium salt of acid (1) and 1.6g (0.015 mole) of β-chloropropionic acid were transformed to β-(2-dibenzofurysulfonyl)propionic acid in the manner given during synthesis of acid (9). Crude product was crystallized from 48% ethanol. Needles, m.p. 174–175.5 °C. Yield 3.1g (68%).

Depression at melting point obtained acids by method a, b and c is not observed.

Analysis:

For C₁₅H₁₂O₅S (304.31) Calcd.: 59.19% C, 3.97% H;

Found : 59.28% C, 3.83% H.

IR (cm⁻¹): 2927 ν_{as} CH₂; 1467 δ CH₂; 1713 ν C=O (COOH); 940 δ OH (COOH); 1306 ν_{as} SO₂; 1137 ν_s SO₂; 631 ν C–S.

16. 2-(1'-phenyl-2'-nitroethylsulfonyl)dibenzofuran

To the warm solution of 2.32g (0.01 mole) of acid (1) in 35cm³ of ethanol, 1.49g (0.01 mole) of ω-nitrostyrene in 10cm³ of ethanol was added dropwise during vigorous stirring and heated for 2h. The resulting solution was concentrated to 20cm³ and forming precipitate was washed at first with 3% Na₂CO₃ solution and finally with water to neutral. Plates, m.p. 179–180 °C were obtained after crystallization from ethanol. Yield 2.25g (67%).

Analysis:

For $C_{20}H_{15}NO_5S$ (381.39) Calcd.: 3.67% N;

Found: 3.69% N.

IR (cm^{-1}): 700 δ $C_{Ar}-H$ (subst. 1); 2921 ν_{as} CH_2 ; 2851 ν_s CH_2 ; 1467 δ CH_2 ;
1558 ν_{as} NO_2 ; 1377 ν_s NO_2 ; 1312 ν_{as} SO_2 ; 1141 ν_s SO_2 .

17. 2-(1'-phenyl-1'-acetonylmethylsulfonyl)dibenzofuran

The warm solution of 1.16g (0.005 mole) of acid (1) in 20cm³ of ethanol was treated with 0.95g (0.0065 mole) of benzylidene acetone in 10cm³ of ethanol during mechanical stirring. The mixture was refluxed for 2h. The precipitate was filtered off and crystallized from ethanol. Needles, m.p. 163–164 °C (with decomposition). Yield 1.2g (63%).

Analysis:

For $C_{22}H_{18}O_4S$ (378.43) Calcd.: 69.82% C, 4.79% H, 8.47% S;

Found: 69.75% C, 4.89% H, 8.52% S.

IR (cm^{-1}): 697 δ $C_{Ar}-H$ (subst. 1); 1708 ν $C=O$; 1467 δ CH_2 ; 1371 δ CH_3 ;
1299 ν_{as} SO_2 ; 1136 ν_s SO_2 .

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STRESZCZENIE

Opisano syntezę i podstawowe właściwości kwasu 2-dibenzofuranosulfinowego. Przeprowadzono reakcje kwasu i jego soli sodowej ze związkami zawierającymi reaktywny halogen oraz układ α,β -nienasycony. Strukturę kwasu 2-dibenzofuranosulfinowego i otrzymanych połączeń o charakterze sulfonów i kwasów sulfonylowych określono metodą analizy elementarnej, analizy widm IR i $^1\text{H-NMR}$.