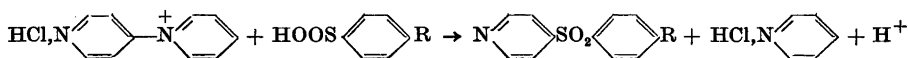
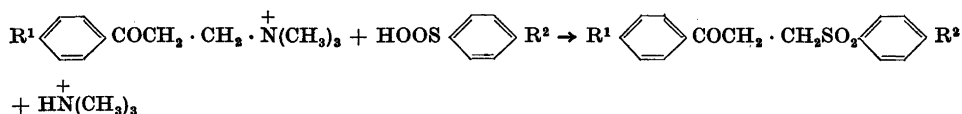


## A Reaction between Certain Quaternary Ammonium Compounds and Sulphinic Acids

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It is known that sulphinic acids can be added to  $\alpha,\beta$ -unsaturated acids, ketones, and aldehydes with formation of sulphones<sup>1</sup>. Thus it was to be expected that Mannich bases easily splitting off the amine group with formation of  $\alpha,\beta$ -unsaturated ketones<sup>2</sup> would react with arylsulphinic acids with formation of  $\beta$ -arylsulphonyl ketones, and this was confirmed. Probably the reaction with the quaternary Mannich bases does not proceed *via* a decomposition to unsaturated ketone, but the quaternary base is likely to act alkylating. The facts that Mannich bases do not decompose under the conditions of synthesis employed, and that pyridylpyridinium chloride reacts correspondingly favour the assumption of this reaction type, an  $S_2$  reaction.



Wieland *et al.*<sup>3</sup> have synthesized indolylmethanesulphonic acid from gramine and sodium hydrogen sulphite, and gramine is expected to react with sulphinic acids with formation of sulphones.

The arylsulphoneketones formed are easily crystallizing substances soluble in ethanol and chloroform but insoluble in water. They form oximes, dinitrophenylhydrazones etc. and can be isolated by Girard reagents.

Aryl- $\gamma$ -pyridyl sulphones are easily crystallizing substances, slightly basic.

## EXPERIMENTAL

All melting points are uncorrected micro melting points. Microanalyses are made by Mr. P. Hansen.

**Quaternary Mannich bases.** The tertiary Mannich bases were prepared according to the method in Organic Syntheses<sup>4</sup>. 150 ml of ether and 45 ml of 10 % NaOH were added to 0.1 mole of the crude product of the hydrochloride. The ether phase was dried with K<sub>2</sub>CO<sub>3</sub>, and 40 g of 30 % methyl bromide in methanol were added. The mixture was left in the ice box for 24 hours. The white precipitate was collected, washed with ether and recrystallized from a mixture of 4 parts of methanol and 1 part of acetone (Table 1).

*The sulphinic acids* were prepared according to the method in Organic Syntheses<sup>5</sup>.

**2-p-Acetamino-phenylsulphonyl-1-benzoylethane; Compound 1.** 6 g of trimethyl- $\omega$ -benzoylethylammonium bromide and 4 g of *p*-acetaminobenzenesulphinic acid were dissolved in 40 ml of ethanol and refluxed for 4 hours. The solid was collected and recrystallized from ethanol. Yield 4.5 g.

The other sulphonyl ketones were prepared according to the above method (Table 2).

**2-p-Aminophenylsulphonyl-1-benzoylethane; Compound 2.** Compound 1 (2g) were refluxed with a mixture of 15 ml of ethanol and 15 ml of 75 % H<sub>2</sub>SO<sub>4</sub> for 1 hour. The solution was poured into 100 ml of water. The precipitate was collected and recrystallized from 75 % ethanol with charcoal. Yield 0.9 g.

**Oxime of compound 3.** Compound 3, (1.2g), 0.5 g of hydroxylamine hydrochloride and 8 ml of pyridine were refluxed for 1 hour, and after cooling poured into 20 ml of water. The mixture was left in the ice box for 12 hours. The solid was collected and recrystallized from dilute ethanol. Yield 0.7 g of white crystals, m.p. 130°.

C<sub>15</sub>H<sub>15</sub>O<sub>2</sub>NS (289.4)      Calc.    N    4.8  
    Found    »    4.8

**Oxime of compound 1.** Was prepared analogously to oxime of compound 3, m.p. 162°.


C<sub>17</sub>H<sub>18</sub>O<sub>4</sub>N<sub>2</sub>S (346.4)      Calc.    N    8.1  
    Found    »    8.0

**Dinitrophenylhydrazone of compound 5.** Yellow needles, m.p. 206°.



C<sub>22</sub>H<sub>20</sub>O<sub>7</sub>N<sub>4</sub>S (484.5)      Calc.    N    11.6  
    Found    »    11.3

**Isolation by Girard P reagent.** Impure compound 10 (0.5g) and 2 g of Girard P were dissolved in 20 ml of ethanol + 1 ml of acetic acid by heating on a waterbath for 2 hours. After cooling in ice the solution was poured into 30 ml of ice-cold water and immediately extracted with 50 ml of chloroform. On addition of 1 ml of concentrated HCl to the aqueous phase a crystalline precipitate was formed which was collected and washed with cold dilute ethanol. Yield 0.2 g, m.p. 152°.



***p*-Tolyl- $\gamma$ -pyridyl sulphone. Compound 13.** 4.5 g of pyridylpyridinium chloride hydrochloride<sup>6</sup> and 3.1 g of *p*-toluenesulphinic acid were refluxed with 50 ml of 75 % ethanol

Table 1. R<sub>1</sub>——COCH<sub>2</sub> · CH<sub>2</sub>N<sup>+</sup>(CH<sub>3</sub>)<sub>3</sub>Br<sup>-</sup>

R <sup>1</sup>	m.p.	Formula	Mol.w.	Calc.	Found
H	238°	C <sub>12</sub> H <sub>18</sub> ON Br	272.2	N    5.1 Br    29.3	N    4.7 Br    29.7
CH <sub>3</sub>	185°	C <sub>13</sub> H <sub>20</sub> ON Br	286.2	N    4.9 Br    27.9	N    5.2 Br    28.7
OCH <sub>3</sub>	180°	C <sub>13</sub> H <sub>20</sub> O <sub>2</sub> N Br	302.2	N    4.6 Br    26.5	N    4.7 Br    26.4
Cl	178°	C <sub>12</sub> H <sub>17</sub> ONCl Br	306.7	N    4.6 Br    26.1	N    4.5 Br    27.0

Table 2.  $R_1$ --CO·CH<sub>2</sub>·CH<sub>2</sub>-SO<sub>2</sub>--R<sub>2</sub>

No.	R <sub>1</sub>	R <sub>2</sub>	m.p.	Formula	Mol.w.	Calc.	Found
1	H	NHCOCH <sub>3</sub>	182°	C <sub>17</sub> H <sub>17</sub> O <sub>4</sub> NS	331.4	C 61.6 H 5.2 N 4.2	C 61.5 H 4.9 N 4.1
2	H	NH <sub>2</sub>	160°	C <sub>15</sub> H <sub>15</sub> O <sub>3</sub> NS	289.4	N 4.8	N 4.9
3	H	H	99°	C <sub>15</sub> H <sub>14</sub> O <sub>3</sub> S	274.4	C 65.7 H 5.1 S 11.7	C 65.7 H 5.2 S 11.4
4	H	Cl	136°	C <sub>15</sub> H <sub>13</sub> O <sub>3</sub> SCl	308.9	C 58.4 H 4.3 Cl 11.5	C 58.0 H 4.1 Cl 11.2
5	H	OCH <sub>3</sub>	123°	C <sub>16</sub> H <sub>16</sub> O <sub>4</sub> S	304.5	C 63.2 H 5.3 S 10.5	C 62.9 H 5.0 S 10.4
6	H	CH <sub>3</sub>	136°	C <sub>16</sub> H <sub>16</sub> O <sub>3</sub> S	288.5	C 66.6 H 5.6	C 66.5 H 5.4
7	H	NO <sub>2</sub>	185°	C <sub>15</sub> H <sub>13</sub> O <sub>5</sub> NS	319.3	C 56.4 H 4.1 N 4.4	C 56.2 H 4.1 N 4.3
8	OCH <sub>3</sub>	H	106°	C <sub>16</sub> H <sub>16</sub> O <sub>4</sub> S	304.5	C 63.2 H 5.3	C 63.5 H 5.3
9	CH <sub>3</sub>	H	117°	C <sub>16</sub> H <sub>16</sub> O <sub>3</sub> S	288.5	C 66.6 H 5.6	C 67.2 H 5.8
10	Cl	H	154°	C <sub>15</sub> H <sub>13</sub> O <sub>3</sub> SCl	308.9	C 58.4 H 4.3 Cl 11.5	C 58.0 H 4.0 Cl 11.3
11	CH <sub>3</sub>	CH <sub>3</sub>	105°	C <sub>17</sub> H <sub>18</sub> O <sub>3</sub> S	302.4	C 67.5 H 6.0 S 10.6	C 67.4 H 6.0 S 10.3

Table 3. N--SO<sub>2</sub>--R

No.	R	m.p.	Formula	Mol.w.	Calc.	Found
12	H	125°	C <sub>11</sub> H <sub>9</sub> O <sub>2</sub> NS	219.3	C 60.3 H 4.1 N 6.4 S 14.6	C 60.2 H 3.8 N 6.4 S 14.5
13	CH <sub>3</sub>	134°	C <sub>12</sub> H <sub>11</sub> O <sub>2</sub> NS	233.3	C 61.8 H 4.8 N 6.0 S 13.7	C 61.4 H 3.9 N 5.9 S 13.7
14	NH <sub>2</sub>	265°	C <sub>11</sub> H <sub>10</sub> O <sub>2</sub> N <sub>2</sub> S	234.3	C 56.4 H 4.3 N 12.0	C 56.5 H 4.1 N 11.9

for 2 hours. The solution was filtered while warm, neutralized with  $\text{Na}_2\text{CO}_3$  and left in the ice box. The crystalline solid was collected and recrystallized from ethanol. Yield 2 g (Table 3).

*Compound 14.* This compound was prepared analogously to compound 13, *p*-acetaminobenzenesulphinic acid being employed. During the synthesis a deacetylation takes place.

Compound 2 and compound 14 have been tested for antibacterial effect on *Mycobacterium avium*. The effect was negligible. (B.Noer.)

#### SUMMARY

A procedure is described for the preparation of sulphones from arylsulphinic acids and certain reactive quaternary ammonium compounds.

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Received September 8, 1953.