

Substituted Sulfonamides

N¹-Chloroacetyl-*p*-nitrobenzenesulfonamide.—To 10 g. of *p*-nitrobenzenesulfonamide dissolved in 100 cc. of 4.4% sodium hydroxide was added, dropwise with stirring at 5°, 7 g. of chloroacetyl chloride (Eastman Kodak Co.). After fifteen minutes, the solution was neutralized with acetic acid and unchanged *p*-nitrobenzenesulfonamide

The precipitate was removed and the filtrate clarified with activated carbon. The product was precipitated, after removal of the carbon, by acidifying the filtrate to congo red. It was dried at 60°, and purified by one recrystallization from benzene-alcohol; yield 1.5 g.

Benzenesulfonamido heterocycles were obtained by the reaction of benzenesulfonyl chloride with the appropriate

TABLE I

Compound	M. P., °C. (cor.)	Formula	Analyses, % ^a					
			Calcd.			Found		
			C	H	N	C	H	N
N ¹ -Chloroacetyl- <i>p</i> -nitrobenzenesulfonamide ^b	172-173	C ₈ H ₇ O ₅ N ₂ SCl			10.1			10.4
N ¹ -Chloroacetylsulfanilamide ^c	157-158	C ₈ H ₉ O ₂ N ₂ SCl	38.6	3.6	11.3	38.7	3.9	10.9
2-Benzenesulfonamidopyridine	171-172	C ₁₁ H ₁₀ O ₂ N ₂ S			12.0			11.6
2-Benzenesulfonamidopyrimidine	229-230	C ₁₀ H ₈ O ₂ N ₂ S	51.1	3.8	17.9	51.0	4.1	17.9
2-Benzenesulfonamido-4-methylpyrimidine	193-194	C ₁₁ H ₁₁ O ₂ N ₂ S			16.9			16.7
2-Benzenesulfonamidothiazole	171-172	C ₉ H ₈ O ₂ N ₂ S ₂	45.0	3.3	11.7	45.0	3.3	11.3
2-Benzenesulfonamido-1,3,4-thiadiazole	188-189	C ₈ H ₆ O ₂ N ₃ S ₂			17.4			17.4

^a Analyses were carried out in these laboratories under the direction of Mrs. Thelma Kirk. ^b Chlorine, calcd. 12.8%; found 12.6%. ^c Chlorine, calcd. 14.3%; found 14.6%.

separated by filtration. The filtrate was acidified to congo red with hydrochloric acid to precipitate the product, which was collected and dried at 60°. It was then recrystallized once from toluene (1 g. per 50 cc.); yield 5 g.

N¹-Chloroacetylsulfanilamide was prepared from 5 g. of finely divided nitro compound which was added at 35° to 12.25 g. of SnCl₂·2H₂O dissolved in 15 cc. of concentrated hydrochloric acid. Some cooling was necessary at first. After standing for eighteen hours, the solution was cooled and made alkaline with 10% sodium carbonate solution.

amino heterocycle in dry pyridine. The general method has been described previously¹; yields ranged from 75-90%.

(1) Roblin and Winnek, *THIS JOURNAL*, **62**, 1999 (1940).

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COMMUNICATIONS TO THE EDITOR

BARBALOIN

Sir:

The recent note by Gardner and Campbell¹ on some reactions of the aloins emboldens us to place on record some experiments made in 1939. We can confirm Rosenthaler's statement² that barbaloin does not give methanol when hydrolyzed with borax and that Cahn and Simonsen's³ observation is incorrect and we have observed also the formation of furfural under certain conditions. Our most fundamental result is however with reference to the empirical formula of barbaloin which was

discussed at some length by Cahn and Simonsen.³ Dr. E. G. Cox of the University of Birmingham has very kindly determined the molecular weight of barbaloin methyl ether by the X-ray crystal structure method and he finds it to be 521. There can therefore now no longer be any doubt that barbaloin methyl ether has the formula C₂₁H₁₇O₂(OMe)₇ from which it would apparently follow that barbaloin itself must be C₂₁H₁₇O₂(OH)₇. This formula for the methyl ether is in accord with the analytical data previously recorded (C, 64.5; H, 7.15; OMe, 40.7. Calcd. C, 64.8; H, 7.4; OMe, 41.9). We hope at some future date to be in a position to continue our experiments

(1) Gardner and Campbell, *THIS JOURNAL*, **64**, 1378 (1942).

(2) Rosenthaler, *Pharm. Acta Helv.*, **9**, 9 (1934).

(3) Cahn and Simonsen, *J. Chem. Soc.*, 2537 (1932).

and we shall then discuss in detail the important implications which follow from this result.

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RECEIVED AUGUST 15, 1942

THE TEMPERATURE COEFFICIENT OF THE CONDUCTANCE OF POTASSIUM CHLORIDE SOLUTIONS

Sir:

In THIS JOURNAL, **64**, 1544 (1942), Li and Fang give conductance data for aqueous solutions of potassium chloride at temperatures from 15 to 40°; they were apparently unaware, understandably enough, of our results both for potassium and sodium chloride solutions at temperatures from 15 to 45° (Gunning and Gordon, *J. Chem. Phys.* **10**, 126 (1942)). Their conductances at 25° are in moderate agreement with those of Shedlovsky, Brown and MacInnes [*Trans. Electrochem. Soc.*, **66**, 165 (1934)] and our own, and their 15° numbers are also in rough agreement with the measurements of Thompson and his associates [THIS JOURNAL, **59**, 2372 (1937); **61**, 1219 (1939)] and ourselves. For 15°, however, they employ a linear extrapolation of the Shedlovsky function Λ_0 ; Shedlovsky, Brown and MacInnes showed that a $c \log c$ term was required for potassium chloride at 25°, and we showed that it was even more important for 15°. It is for this reason that the value Li and Fang give for Λ_0 at this temperature (120.88) is considerably less than the one we obtained by an extrapolation from much lower concentrations, *viz.*, 121.09.

The values of Λ_0 at 30° and 40° reported by Li and Fang are, however, about 0.25 and 1.1% less than those obtainable by interpolation in Gunning and Gordon's Table V. From LeRoy, Allgood and Gordon's transference data [*J. Chem. Phys.*, **8**, 418 (1940)] t_{-}^0 is 0.5103 at 30° and 0.5120 at 40°; combining these with Li and Fang's values of Λ_0 , one obtains 84.00 and 99.42 as the limiting mobility of chloride ion at these temperatures; Gunning and Gordon's Table VI, which resulted from a consideration of the transference and conductance measurements for *both* salts, gives 84.22 and 100.52. Interpolation of Owen and Sweeton's results for hydrochloric acid solutions [THIS JOURNAL, **63**, 2811 (1941)] gives 84.3 and 100.9; these are in agreement with Gunning and Gordon's values within the uncertainty of the transference numbers Owen and Sweeton were forced to employ.

If the discrepancy be ascribed to error in the temperature, this would correspond to a difference of 0.1° at 30° and to 0.6° at 40°; Li and Fang give no information about their temperature scale beyond stating that they used standard thermometers; our temperatures were determined by platinum resistance thermometer with N. B. S. certificate. It would therefore seem that Li and Fang's 30° and 40° data should be considered, for the moment at any rate, with reserve.

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RECEIVED JULY 29, 1942

NEW BOOKS

Introduction to the Theory of Relativity. By PETER GABRIEL BERGMANN, Member, Institute for Advanced Study, 1936-1941; Assistant Professor of Physics, Black Mountain College. With a Foreword by Albert Einstein. Prentice-Hall, Inc., 70 Fifth Avenue, New York, N. Y., 1942. xvi + 287 pp. Illustrated. 15.5 × 23.5 cm. Price, \$4.50.

This book not only appears with the *imprimatur* of Albert Einstein, but contains, p. 253, some hitherto unpublished work by Einstein and Bergmann. The proof-reading has been astonishingly thorough: "mass" for "velocity" on p. 92, and superscript "s" for "5" in equation (18.24) on the very last page of the text, are the only errors the reviewer has found; he has, however, some differences of opinion with the author. The distinction between

Riemannian and Lobachevskian spaces should be preserved, even if it is not of particular interest to the present discussion. The author recognizes, p. 60, that "only when n is 3 is the 'conjugate' tensor density to a tensor of rank 2 a vector density," but still adheres to Hamilton's definition of the vector product. (To one reader, at least, tensor densities seem "excess baggage.") The treatment of relativistic electrodynamics in Chapter VII is distinctly less elegant than that of E. B. Wilson and G. N. Lewis (1912), principally because the author has given the Cartesian interpretation of the derivation, step by step; to the reader who is not prepared to *think* in tensor terms this will not seem a defect.

The convention of calling tensors of negative rank "covariant" and those of positive rank "contravariant" is