Organic Syntheses

A Publication
of Reliable Methods
for the Preparation
of Organic Compounds

Working with Hazardous Chemicals

The procedures in *Organic Syntheses* are intended for use only by persons with proper training in experimental organic chemistry. All hazardous materials should be handled using the standard procedures for work with chemicals described in references such as "Prudent Practices in the Laboratory" (The National Academies Press, Washington, D.C., 2011; the full text can be accessed free of charge at http://www.nap.edu/catalog.php?record_id=12654). All chemical waste should be disposed of in accordance with local regulations. For general guidelines for the management of chemical waste, see Chapter 8 of Prudent Practices.

In some articles in *Organic Syntheses*, chemical-specific hazards are highlighted in red "Caution Notes" within a procedure. It is important to recognize that the absence of a caution note does not imply that no significant hazards are associated with the chemicals involved in that procedure. Prior to performing a reaction, a thorough risk assessment should be carried out that includes a review of the potential hazards associated with each chemical and experimental operation on the scale that is planned for the procedure. Guidelines for carrying out a risk assessment and for analyzing the hazards associated with chemicals can be found in Chapter 4 of Prudent Practices.

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These paragraphs were added in September 2014. The statements above do not supersede any specific hazard caution notes and safety instructions included in the procedure.

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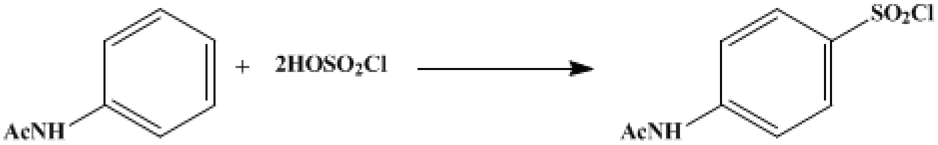
Organic Syntheses, Coll. Vol. 1, p.8 (1941); Vol. 5, p.3 (1925).

p-ACETAMINOBENZENESULFONYL CHLORIDE

[Sulfanilyl chloride, N-acetyl-]



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1. Procedure

In a 500-cc. round-bottomed flask, fitted with a mechanical stirrer, is placed 290 g. (165 cc., 2.49 moles) of chlorosulfonic acid (Note 1). The flask is surrounded by a cooling bath and cooled with running water to about 12–15°. To the chlorosulfonic acid is added gradually 67.5 g. (0.5 mole) of acetanilide. This requires about fifteen minutes if the temperature is maintained at approximately 15°. Since large volumes of hydrogen chloride are evolved, the reaction should be conducted in a good hood, or a gas absorption trap (Fig. 7 on p. 97) might be used. After all the acetanilide has been added, the mixture is heated to 60° for two hours to complete the reaction (Note 2).

The sirupy liquid is poured slowly, with stirring (Note 3), into 1 kg. of ice to which just enough water has been added to make stirring easy. This decomposition of the excess chlorosulfonic acid should be carried out in the hood. The solid sulfonyl chloride which separates is collected on a suction funnel (Note 4) and washed with water. The yield of crude material is 90–95 g. (77–81 per cent of the theoretical amount based on the acetanilide).

This crude material may be used directly in many preparations such as *p*-acetaminobenzenesulfinic acid (p. 7). If a pure product is desired, the crude material is dried by pressing on a porous plate and then crystallized from dry benzene. The acid chloride is slightly soluble in benzene, and only 1.5 to 2 g. will dissolve in 100 cc. of hot benzene. On cooling, about 75 per cent of the material separates from the benzene in thick, colorless prisms melting at 149° (Note 5).

2. Notes

1. The chlorosulfonic acid should be freshly distilled. Smaller amounts of this reagent may be used without reducing the yield or affecting the quality of the product. However, with smaller amounts the time required for the reaction must be increased. Thus, if 175 g. (1.5 moles) of chlorosulfonic acid is used with 67.5 g. (0.5 mole) of acetanilide, an additional hour of heating is required to obtain the yields mentioned above.
2. The hydrogen chloride which is liberated during the reaction fills the mixture with tiny bubbles. When these disappear the reaction is complete.
3. Mechanical stirring is most convenient but not necessary.
4. A rather large suction funnel (125 mm. or more) should be used in the filtration as the sulfonyl chloride has a tendency to clog the filter.
5. The purification is the least satisfactory part of the preparation. The material must not be heated while water is still present, or excessive decomposition will occur. As the sulfonyl chloride is only slightly soluble in hot benzene, it is inconvenient to crystallize more than a small amount at a time. The crude product does not keep well and must be used at once. After recrystallization it may be kept indefinitely.

3. Discussion

p-Acetaminobenzenesulfonyl chloride can be prepared by the action of phosphorus pentachloride[1] or chlorosulfonic acid[2] on sodium *p*-acetaminobenzenesulfonate and by the action of chlorosulfonic acid on acetanilide.[3]

This preparation is referenced from:

- Org. Syn. Coll. Vol. 1, 7

References and Notes

1. Schroeter, Ber. **39**, 1563 (1906).
2. Goldyrev and Postovskii, J. Applied Chem. (U.S.S.R.) **11**, 316 (1938) [C. A. **32**, 5800 (1938)].
3. Stewart, J. Chem. Soc. **121**, 2558 (1922).

Appendix
Chemical Abstracts Nomenclature (Collective Index Number); (Registry Number)

sulfonyl chloride

acid chloride

hydrogen chloride (7647-01-0)

Benzene (71-43-2)

Acetanilide (103-84-4)

Sulfanilyl chloride, N-acetyl-,
p-Acetaminobenzenesulfonyl chloride (121-60-8)

chlorosulfonic acid (7790-94-5)

phosphorus pentachloride (10026-13-8)

p-Acetaminobenzenesulfinic acid (710-24-7)

sodium p-acetaminobenzenesulfonate