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.

The procedures described in *Organic Syntheses* are provided as published and are conducted at one's own risk. *Organic Syntheses, Inc.*, its Editors, and its Board of Directors do not warrant or guarantee the safety of individuals using these procedures and hereby disclaim any liability for any injuries or damages claimed to have resulted from or related in any way to the procedures herein.

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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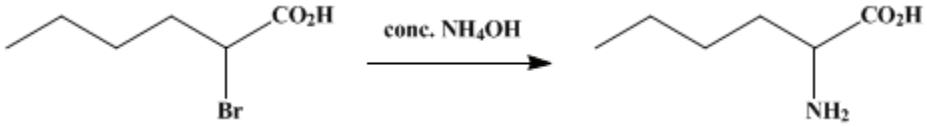
α-AMINO-*n*-CAPROIC ACID

[Norleucine]



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1. Procedure

In a 1-l. round-bottomed flask is placed 760 g. (844 cc.) of concentrated aqueous ammonia (sp. gr. 0.9) and to this is slowly added 150 g. (0.77 mole) of α-bromocaproic acid (Note 1). The flask is well stoppered and allowed to stand in a warm place (50-55°) for twenty to thirty hours. The amino acid separates and is filtered off with suction and washed with methyl alcohol (Note 2). This crop of crystals weighs 51–56 g. The aqueous filtrate is evaporated nearly to dryness on a steam bath and then treated with about 250 cc. of methyl alcohol. This precipitates a second crop of amino acid contaminated with ammonium bromide. On washing with methyl alcohol and recrystallizing from water, there is obtained 10–15 g. more of pure product. The total yield is 63–68 g. (62–67 per cent of the theoretical amount).

2. Notes

1. The once-distilled bromocaproic acid (p. 115) is satisfactory.
2. If the amino acid is not carefully washed with alcohol, it contains ammonium bromide and may possess an objectionable odor. Methyl alcohol is preferable to ethyl alcohol since it dissolves ammonium bromide more readily.

3. Discussion

α-Amino-*n*-caproic acid can be prepared by the action of ammonia on α-bromo-*n*-caproic acid,[1] and by the alkylation with butyl bromide of benzoylaminomalonic ester with subsequent hydrolysis.[2]

References and Notes

1. Hüfner, J. prakt. Chem. (2) **1**, 7 (1870); Fischer, Ber. **33**, 2381 (1900); Abderhalden, Froehlich and Fuchs, Z. physiol. Chem. **86**, 456 (1913); Adams and Marvel, J. Am. Chem. Soc. **42**, 320 (1920); E. I. du Pont de Nemours & Co., U. S. pat. 2,109,929 [C. A. **32**, 3424 (1938)].
2. Painter, J. Am. Chem. Soc. **62**, 232 (1940).

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

benzoylaminomalonic ester

ethyl alcohol,
alcohol (64-17-5)

ammonia (7664-41-7)

methyl alcohol (67-56-1)

ammonium bromide (12124-97-9)

Butyl bromide (109-65-9)

Norleucine (327-57-1)

α-Bromocaproic acid,
α-bromo-n-caproic acid (616-05-7)

bromocaproic acid (4224-70-8)

α-AMINO-n-CAPROIC ACID (616-06-8)