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.

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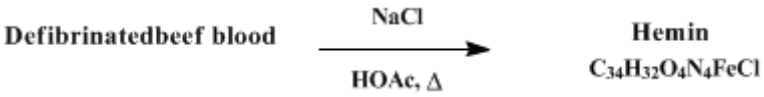
These paragraphs were added in September 2014. The statements above do not supersede any specific hazard caution notes and safety instructions included in the procedure.

DOI:10.15227/orgsyn.021.0053

Organic Syntheses, Coll. Vol. 3, p.442 (1955); Vol. 21, p.53 (1941).

HEMIN



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1. Procedure

In a 5-l. round-bottomed flask equipped with a thermometer, reflux condenser, and dropping funnel are placed 4 l. of glacial acetic acid and 1 g. of sodium chloride. The acid is heated to boiling on a sand bath until the sodium chloride is in solution, and then 1 l. of defibrinated blood (Note 1) is added in a thin stream from the dropping funnel over a period of about 30 minutes. The blood should not touch the sides of the flask. During this time the temperature is kept at 100–105°, and heating is continued for 10 minutes after all the blood has been added. The flame is then removed and the mixture allowed to cool and stand overnight.

The precipitated hemin is removed by centrifuging (Note 2). If the centrifuging is carried out in 100-ml. tubes, each lot of tubes is centrifuged 10 minutes, the supernatant liquid is decanted, more of the mixture added, and the centrifuging repeated. The hemin is allowed to accumulate in the tubes until all the mixture has been centrifuged, after which it is stirred with a glass rod and washed from the several tubes into one with 75 ml. of 50% aqueous acetic acid. After centrifuging and decanting, the hemin is washed successively in the same manner with two 75-ml. portions of distilled water, one 50-ml. portion of 95% ethanol, and one 50-ml. portion of ether. After the ether has been decanted the hemin is transferred to a watch glass by means of a rubber policeman and about 5 ml. of ether. After evaporation to dryness 3.5–4.5 g. of crude product is obtained.

For recrystallization, 5 g. of the crude hemin is placed in a 100-ml. Erlenmeyer flask, 25 ml. of pyridine is added, and the flask is shaken until the hemin has dissolved. Forty milliliters of chloroform is added, and the flask is stoppered with a cork and shaken for 15 minutes; the cork is carefully removed from time to time to release the pressure. The solution is then filtered with slight suction through a small Büchner funnel, and the Erlenmeyer flask and filter are washed with 15 ml. of chloroform.

During the shaking 350 ml. of glacial acetic acid is heated to boiling in a 600-ml. beaker under a hood, and 5 ml. of a saturated sodium chloride solution and 4 ml. of concentrated hydrochloric acid are added. The flame is extinguished, and the filtered hemin solution poured in a steady stream with stirring into the hot mixture; the suction flask is rinsed with 15 ml. of chloroform. After the mixture has stood for 12 hours, the crystals are filtered with suction on a small Büchner funnel and washed with 50 ml. of 50% aqueous acetic acid, 100 ml. of distilled water, 25 ml. of ethanol, and 25 ml. of ether. Suction is continued until the crystals are dry, when they can be readily removed. The recovery is 75–85%.

2. Notes

1. Fresh blood obtained from a slaughter house is defibrinated by whipping it with a stiff vegetable-fiber brush followed by filtration with suction through a large Büchner funnel. The blood is stirred during the filtration to prevent settling of the erythrocytes. Beef blood was used for checking this preparation.
2. The hemin may be removed by filtration but it is usually so finely divided that centrifuging is easier and less loss results.

3. Discussion

Hemin has been synthesized,[1] but it is always prepared from blood.[2]

References and Notes

1. Fischer and Zeile, *Ann.*, **468**, 98 (1929).
2. Nencki and Zaleski, *Z. physiol. Chem.*, **30**, 390 (1900); Piloty, *Ann.*, **377**, 358 (1910).

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

HEMIN

ethanol (64-17-5)

hydrochloric acid (7647-01-0)

acetic acid (64-19-7)

ether (60-29-7)

chloroform (67-66-3)

sodium chloride (7647-14-5)

pyridine (110-86-1)

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