Organic Syntheses, Coll. Vol. 2, p.363 (1943); Vol. 16, p.44 (1936).

ISONITROSOPROPIOPHENONE

[1,2-Propanedione, 1-phenyl-, 2-oxime]

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1. Procedure

A 3-l. three-necked, round-bottomed flask (A, Fig. 11) is provided with a reflux condenser, liquid-sealed mechanical stirrer, and two gas delivery tubes (T_1 and T_2) which extend as far as possible into the flask. Methyl nitrite is generated in a 2-l. Erlenmeyer flask B which is fitted with a 500-cc. dropping funnel C and connected to A by the tube T_1. Dry hydrogen chloride is introduced through T_2. The apparatus is assembled preferably in a hood with effective draft.

Fig. 11

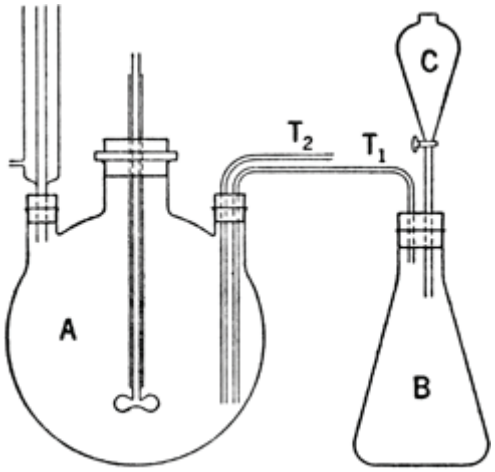

FIG. 11.

In A is placed a solution of 469 g. (3.5 moles) of propiophenone (Note 1) in 2.3 l. of ordinary ethyl ether, and in B a mixture of 290 g. (4 moles) of 95 per cent sodium nitrite, 180 cc. (142 g., 4.5 moles) of methyl alcohol, and 170 cc. of water. In the dropping funnel C is placed 455 cc. of cold dilute sulfuric acid (prepared by adding one volume of concentrated acid to two volumes of water).

The stirrer is started, and hydrogen chloride is introduced through T_2 at the rate of 6–10 bubbles a second. The acid in C is allowed to drop slowly into B, and the gaseous methyl nitrite (Note 2) is introduced through T_1 into the reaction mixture. The solution in A develops a brown-red color, and after about ten minutes the ether begins to reflux gently (Note 3). The rate of evolution of methyl nitrite is then adjusted so that the ether continues to reflux gently. About four hours is required for addition of the methyl nitrite. Stirring and addition of hydrogen chloride are continued for thirty minutes longer; at the end of this time the solution has ceased boiling and has assumed a clear yellow color.

The reaction mixture is allowed to stand for several hours (preferably overnight) and is then extracted repeatedly with 500-cc. portions of 10 per cent sodium hydroxide solution, until the alkaline extracting medium remains practically colorless when shaken with the ethereal solution (Note 4).

Usually five 500-cc. portions of the sodium hydroxide solution are required. The combined alkaline extracts are poured slowly, with stirring, into a mixture of 700–750 cc. of concentrated hydrochloric acid and about 1 kg. of ice. The crystals of isonitrosopropiophenone are filtered with suction and dried. The product weighs 370–390 g. (65–68 per cent of the theoretical amount) and melts at 111–113°. This material can be crystallized from about 550 cc. of toluene and yields 315–335 g. of snow-white crystals, m.p. 112–113° (Note 5).

2. Notes

1. Propiophenone may be prepared in 70–80 per cent yields from benzene and propionyl chloride or propionic anhydride, in the presence of aluminum chloride.
2. For the preparation of small amounts of the isonitrosoketone it is more convenient to employ a higher-boiling alkyl nitrite, such as butyl nitrite (p. 108), which can be added directly to the reaction mixture by substituting a dropping funnel for the tube T_1. Butyl nitrite must be freshly prepared or redistilled shortly before use.
3. The rate of stirring must be kept fairly constant since an abrupt increase in speed may cause the ether to boil at a dangerous rate.
4. The ethereal solution remaining from the alkaline extractions contains unreacted propiophenone which may be recovered by distilling the ether and fractionating the residue. The amount of recovered propiophenone, collected at 210–216°, varies from 80 to 110 g.
5. About 25–30 g. of material may be recovered from the toluene mother liquor by extraction with alkali and reprecipitation with acid.

3. Discussion

Isonitrosopropiophenone has been prepared from esters of α-benzoylpropionic acid by a process involving saponification, nitrosation, and decarboxylation;[1] from 1-phenyl-1,2-propanedione by the action of hydroxylamine;[2] and from propiophenone by treatment with amyl nitrite,[3] methyl nitrite,[4] or butyl nitrite.[5]

This preparation is referenced from:

- Org. Syn. Coll. Vol. 3, 20
- Org. Syn. Coll. Vol. 3, 191
- Org. Syn. Coll. Vol. 3, 853
- Org. Syn. Coll. Vol. 6, 199

References and Notes

1. v. Pechmann and Müller, Ber. **21**, 2119 (1888).
2. Kolb, Ann. **291**, 292 (1896).
3. Claisen and Manasse, Ber. **22**, 529 (1889).
4. Slater, J. Chem. Soc. **117**, 590 (1920).
5. Hartung and Munch, J. Am. Chem. Soc. **51**, 2264 (1929).

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

sulfuric acid (7664-93-9)

hydrogen chloride,

hydrochloric acid (7647-01-0)

Benzene (71-43-2)

methyl alcohol (67-56-1)

ether,
ethyl ether (60-29-7)

sodium hydroxide (1310-73-2)

sodium nitrite (7632-00-0)

aluminum chloride (3495-54-3)

toluene (108-88-3)

Butyl nitrite (544-16-1)

amyl nitrite (463-04-7)

hydroxylamine (7803-49-8)

methyl nitrite (624-91-9)

Propiophenone (93-55-0)

α-benzoylpropionic acid (2051-95-8)

ISONITROSOPROPIOPHENONE

1,2-Propanedione, 1-phenyl-, 2-oxime (119-51-7)

propionyl chloride (79-03-8)

propionic anhydride (123-62-6)

1-phenyl-1,2-propanedione (579-07-7)