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.

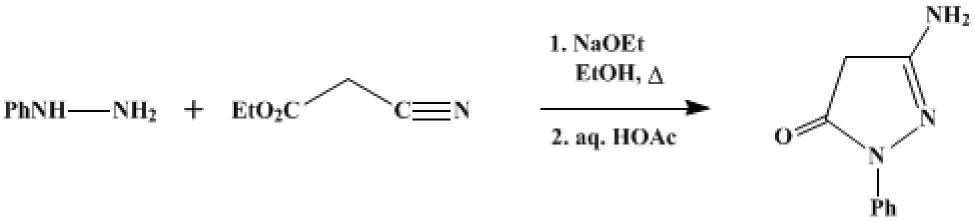
These paragraphs were added in September 2014. The statements above do not supersede any specific hazard caution notes and safety instructions included in the procedure.

DOI:10.15227/orgsyn.028.0087

Organic Syntheses, Coll. Vol. 3, p.708 (1955); Vol. 28, p.87 (1948).

1-PHENYL-3-AMINO-5-PYRAZOLONE

[5-Pyrazolone, 3-amino-1-phenyl-]



Submitted by H. D. Porter and A. Weissberger.
Checked by R. T. Arnold and K. Murai.

1. Procedure

Sodium ethoxide is prepared from 46 g. (2 gram atoms) (Note 1) of sodium and 800 ml. of absolute ethanol in a 2-l. three-necked flask equipped with stirrer and a reflux condenser. To the hot solution is added 113 g. (106 ml., 1 mole) of ethyl cyanoacetate followed by 108 g. (98 ml., 1 mole) of phenylhydrazine (Note 2), and the mixture is stirred and heated in an oil bath at 120° for 16 hours. Then most of the ethanol is removed under reduced pressure and the residue is dissolved in 1 l. of water; the mixture is warmed to about 50° and stirred to facilitate solution. After being cooled to room temperature, the solution is extracted with three 100-ml. portions of ether (Note 3). The aqueous phase is acidified by the addition of 100 ml. of glacial acetic acid, cooled in ice, and filtered. The crude product is washed on the filter with 100 ml. of 95% ethanol; it is then transferred to a flask and boiled with 500 ml. of the same solvent, and this mixture is cooled and filtered. The solid is washed with ethanol and dried. The tan crystalline 1-phenyl-3-amino-5-pyrazolone, melting with decomposition at 216–218°, weighs 76–82 g. (43–47%) (Note 4).

2. Notes

1. At least two equivalents of sodium ethoxide are necessary for the reaction, but larger amounts do not improve the yield. Sodium hydroxide in ethanol, or sodamide in benzene, cannot be substituted for the sodium ethoxide solution.
2. All the chemicals used were obtained from the Eastman Kodak Company.
3. Instead of the isolation of the product by concentration, solution in water, and extraction with ether, water may be added directly to the ethanolic solution and the resulting solution acidified. This procedure, however, often leads to a more highly colored product.
4. This material is sufficiently pure for most purposes. If desired, an almost white product may be obtained by two recrystallizations from dioxane (Norit). This treatment entails a 40% loss of the product and raises the melting point by only 2° (to 218–220°).

3. Discussion

The procedure is essentially that given by Conrad and Zart for the original preparation of the substance,[1] to which they assigned the incorrect structure of 1-phenyl-3-hydroxy-5-pyrazolone imide.[2] The compound may also be prepared in about the same yield by the reaction of phenylhydrazine with ethyl malonate monoimidoester.[3]

The procedure given has been applied with varying success to a number of aromatic and heterocyclic hydrazines.[4]

References and Notes

1. Conrad and Zart, *Ber.*, **39**, 2282 (1906).
2. Weissberger and Porter, *J. Am. Chem. Soc.*, **64**, 2133 (1942).
3. Weissberger, Porter, and Gregory, *J. Am. Chem. Soc.*, **66**, 1851 (1944).
4. Weissberger and Porter, *J. Am. Chem. Soc.*, **66**, 1849 (1944).

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

ethyl malonate monoimidoester

ethanol (64-17-5)

acetic acid (64-19-7)

Benzene (71-43-2)

ether (60-29-7)

sodium hydroxide (1310-73-2)

Phenylhydrazine (100-63-0)

sodium (13966-32-0)

sodium ethoxide (141-52-6)

Ethyl cyanoacetate (105-56-6)

dioxane (123-91-1)

sodamide (7782-92-5)

1-Phenyl-3-amino-5-pyrazolone,
5-Pyrazolone, 3-amino-1-phenyl- (4149-06-8)

1-phenyl-3-hydroxy-5-pyrazolone imide