



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](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.

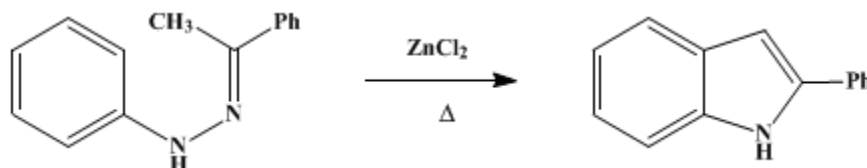
The procedures described in *Organic Syntheses* are provided as published and are conducted at one's own risk. *Organic Syntheses, Inc.*, its Editors, and its Board of Directors do not warrant or guarantee the safety of individuals using these procedures and hereby disclaim any liability for any injuries 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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## 2-PHENYLINDOLE

[Indole, 2-phenyl-]



Submitted by R. L. Shriner, W. C. Ashley, and E. Welch.  
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### 1. Procedure

In a tall 1-l. beaker is placed an intimate mixture of 53 g. (0.25 mole) of freshly prepared [acetophenone phenylhydrazone](#) ([Note 1](#)) and 250 g. of powdered anhydrous [zinc chloride](#) ([Note 2](#)). The beaker is immersed in an oil bath at 170°, and the mixture is stirred vigorously by hand. The mass becomes liquid after 3–4 minutes, and evolution of white fumes begins. The beaker is removed from the bath, and the mixture is stirred for 5 minutes. In order to prevent solidification to a hard mass, 200 g. of clean sand is thoroughly stirred into the reaction mixture. The [zinc chloride](#) is dissolved by digesting the mixture overnight on the steam cone with 800 ml. of water and 25 ml. of concentrated [hydrochloric acid](#) (sp. gr. about 1.2). The sand and crude [2-phenylindole](#) are removed by filtration, and the solids are boiled with 600 ml. of 95% [ethanol](#). The hot mixture is decolorized with [Norit](#) and filtered through a hot 10-cm. Büchner funnel, and the sand and [Norit](#) are washed with 75 ml. of hot [ethanol](#). After the combined filtrates are cooled to room temperature, the [2-phenylindole](#) is collected on a 10-cm. Büchner funnel and washed three times with small amounts (15–20 ml.) of cold [ethanol](#). The first crop is quite pure; after drying in a vacuum desiccator over [calcium chloride](#) it weighs 30–33 g. and melts at 188–189° (cor.) ([Note 3](#)) and ([Note 4](#)).

A little [Norit](#) is added to the combined filtrate and washings, which are then concentrated to a volume of 200 ml. and filtered. The filtrate, on cooling, deposits a second crop of 5–6 g. ([Note 5](#)) of impure product, which melts at 186–188°. The total yield of [2-phenylindole](#) is 35–39 g. (72–80%).

### 2. Notes

- [Acetophenone phenylhydrazone](#) is prepared<sup>1</sup> by warming a mixture of 40 g. (0.33 mole) of [acetophenone](#) and 36 g. (0.33 mole) of [phenylhydrazine](#) on the steam cone for 1 hour. The hot mixture is dissolved in 80 ml. of 95% [ethanol](#), and crystallization is induced by agitation. The mixture is then cooled in an ice bath, and the product is removed and washed with 25 ml. of [ethanol](#). There is obtained 54–57 g. of white product. A second crop of 4–10 g. is obtained by concentrating the combined filtrate and washings. The combined solids are dried under reduced pressure, over [calcium chloride](#), for 30 minutes. The total yield of [acetophenone phenylhydrazone](#), m.p. 105–106°, is 61–64 g. (87–91%).
- It has been reported<sup>2</sup> that such a large amount of [zinc chloride](#) is not necessary, but the submitters found that equal parts of [acetophenone phenylhydrazone](#) and [zinc chloride](#) gave lower yields.
- Using 3.2 times the quantities specified above, except that no sand was added in separating the product, the checkers have obtained yields of 75–80% of [2-phenylindole](#).
- While drying, the surface of the product becomes very light green.
- The filtrate still contains some [2-phenylindole](#), but great difficulty is encountered in trying to purify the crude material.

### 3. Discussion

[2-Phenylindole](#) has been prepared by heating [benzoyl-\*o\*-toluidine](#) in an atmosphere of [hydrogen](#),<sup>3</sup> the reaction being improved by the use of sodium amyloxyde as the condensing agent; by heating

phenylacetaldehydephenylhydrazone with 5 parts of anhydrous zinc chloride;<sup>4</sup> by warming phenacyl bromide<sup>5,6</sup> or N-phenacylaniline with aniline,<sup>7</sup> aniline hydrochloride, or zinc chloride;<sup>8</sup> by elimination of water from o-aminodesoxybenzoin,<sup>9</sup> prepared in turn from o-nitrodesoxybenzoin; by dehydration of benzal-o-toluidine;<sup>10</sup> by the action of anhydrous zinc chloride<sup>11</sup> or boron trifluoride<sup>12</sup> upon the phenylhydrazone of acetophenone; by the action of potassium amide and potassium nitrate upon 2-phenyl-4-quinolinecarboxylic acid.<sup>13</sup> N<sup>15</sup>-2-Phenylindole has been prepared from the  $\alpha$ -N<sup>15</sup>-phenylhydrazone of acetophenone.<sup>14</sup>

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## References and Notes

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

sodium amyloxide

o-aminodesoxybenzoin

o-nitrodesoxybenzoin

phenylhydrazone of acetophenone

N<sup>15</sup>-2-Phenylindole

$\alpha$ -N<sup>15</sup>-phenylhydrazone of acetophenone

ethanol (64-17-5)

calcium chloride (10043-52-4)

hydrochloric acid (7647-01-0)

aniline (62-53-3)

hydrogen (1333-74-0)  
aniline hydrochloride (142-04-1)  
Phenylhydrazine (100-63-0)  
Acetophenone (98-86-2)  
Norit (7782-42-5)  
zinc chloride (7646-85-7)  
potassium nitrate (7757-79-1)  
boron trifluoride (7637-07-2)  
Phenacyl bromide (70-11-1)  
acetophenone phenylhydrazone  
potassium amide  
2-Phenylindole,  
Indole, 2-phenyl- (948-65-2)  
phenylacetaldehydephenylhydrazone  
N-phenacylaniline  
2-phenyl-4-quinolinecarboxylic acid (132-60-5)  
benzoyl-o-toluidine  
benzal-o-toluidine