NICKEL ACETATE AS EFFICIENT ORGANOMETALLIC CATALYST FOR SYNTHESIS OF BIS (INDOLYL) METHANES

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ABSTRACT

Bis(indolyl) methanes derivatives have been synthesized using a catalytic amount of organometallic anhydrous nickel acetate at room temperature with excellent yields. The remarkable selectivity under mild, neutral and, inexpensive catalyst are attractive features.

Key words: Bis(indolyl) methanes, Nickel acetate, Aldehydes, Ketones.

INTRODUCTION

The development of simple, efficient and economically viable chemical process or methodologies for widely used organic compounds are in great demand. Various methods have been developed for their synthesis using Lewis acid catalysts, ionic liquids, trichloro-1,3,5-triazine, and potassium hydrogen sulphate. However, many of these reported methods suffer from one or more disadvantages such as harsh experimental procedure and reagents that are expensive, moisture sensitive. A mild and efficient catalyst for the synthesis of bis(indolyl) methanes is highly desirable.

EXPERIMENTAL

In this communication, we report a synthesis of Bis(indolyl) methanes by using organometallic anhydrous nickel acetate as catalyst. A wide variety of compounds that were
applied to the optimal reaction conditions to prepare a wide range of bis(indolyl) methanes (Scheme 1).

R, R’ = H, Phenyl, Alkyl

Scheme 1

General experimental procedure for Bis(indolyl) methanes

A mixture of benzaldehyde (2 mmol), Indole (4 mmol) and anhydrous Ni(OAc)₂ (0.1 mmol, 30 mg) was stirred magnetically at room temperature, acetonitrile (1 mL) and the progress of the reaction was monitored by thin-layer chromatography. The product was dried over anhydrous Na₂SO₄ and further purification by column chromatography.

RESULTS AND DISCUSSION

The reaction proceeded efficiently and smoothly at room temperature in presence of anhydrous Ni(OAc)₂ as a catalyst, and the products were obtained in excellent yields. Various aromatic aldehydes, aliphatic aldehyde and ketones gives the corresponding products with excellent yield (Table 1, entries 1-9).

Table 1: Synthesis of bis(indolyl) methanes

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<tr>
<th>Entry</th>
<th>Aldehyde (a)</th>
<th>Indoles</th>
<th>Product (b)</th>
<th>Time (min)</th>
<th>Yield (%)</th>
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<td><img src="image2.png" alt="Product" /></td>
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Cont…
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<td>Indoles</td>
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<td>PhCHO</td>
<td>[NH]</td>
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</table>

The substrate was treated with indole (4 mmol) by stirring at room temperature with anhydrous Ni(OAc)₂ in presence of acetonitrile as solvent.

All products were identified by their IR and ¹H NMR spectra.

Isolated yields after column chromatography.

Spectral data

3,3'-Bisindolyl phenyl methane (1b): Pale-red solid, yield 94%, m.p. 122-124°C

IR (KBr): 736, 1012, 1173, 1336, 1415, 1599, 2848, 3024, 3054, 3409 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ = 7.8 (s, 2H); 7.1-7.4 (br m, 8H); 6.3-6.8 (m, 5H); 4.1-4.4 (s, 2NH);
2.2 (s, H): $^{13}$C NMR (CDCl$_3$): 144.1, 136.7, 128.7, 128.6, 127.2, 126.9, 123.7, 121.9, 119.9, 111.1, 40.2. EIMS; m/z 322

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REFERENCES


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