



ISSN: 2350-0328

**International Journal of Advanced Research in Science,
Engineering and Technology**

Vol. 4, Issue 5 , May 2017

Synthesis of Bis (Indolyl) Methane from some aromatic aldehydes using natural acid catalysts

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ABSTRACT: The current study deals with synthesis of bis indoles from some aromatic aldehydes and 2-phenyl indole. Bis phenyl indoles and their derivatives are the important organic compounds. This study synthesized bis indoles using natural acid catalysts viz, Sweet lemon, Citrus limmeta, Tamarind, Amla, Butter milk and pineapple juices.

KEYWORDS: Natural acid catalysts, 2-phenyl indole, Aromatic aldehydes.

I. INTRODUCTION

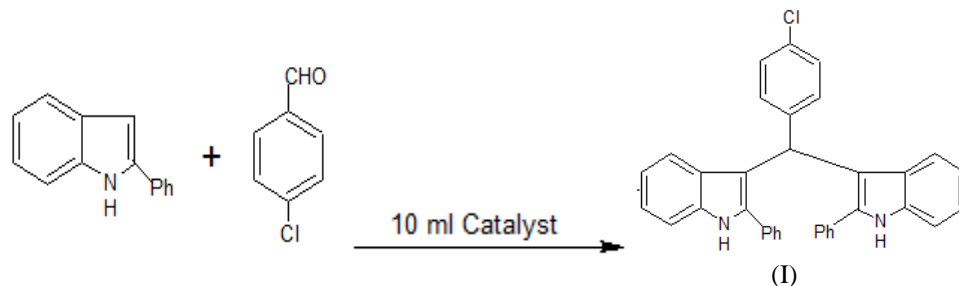
The electrophilic substitution reaction of indoles with carbonyl compounds like aldehydes and ketones to produce bis(indolyl) alkane is an acid catalyzed reaction and both protic as well as Lewis acids¹. Bis (2-Phenyl indolyl) methanes which contain two substituted indole units in a molecule are an important group of bioactive metabolites of terrestrial and marine origin². Indoles and their derivatives are used as neuroprotective agent affecting oxidative stress, neurotransmitter serotonin involved in various physiological functions³. Indoles prevents the breast cancer and also promotes the metabolism of estrogen both in men & women⁴. Organic synthesis using water as a solvent have been attracted much attention because water is considerably safe, non-toxic, environmentally-friendly and cheap compared to other harmful organic solvents^{5,6}. Ionic liquids have attracted extensive research interest in recent years as properties like non-inflammability, negligible vapor pressure, reusability and high thermal stability⁷. Transition metal Lewis acids are promising and interesting precursor for the synthesis of bis (Indolyl) methanes⁸.

The present work based on the synthesis of 4-Chloro phenyl bis (2-phenylindolyl) methane (I), 3-Nitro phenyl bis(2-phenylindolyl) methane(II) and 2-hydroxyphenyl bis(2-phenylindolyl) methane(III) from p-chlorobenzaldehyde, m-nitrobenzaldehyde and salicylaldehyde respectively using some natural acid catalysts.

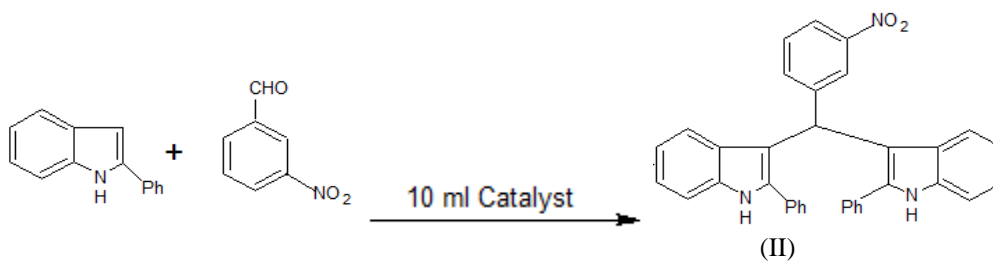
II. METHODS AND MATERIALS

2-phenyl indole was prepared by using commercial method. To the mixture of 2-phenyl indole (4mmol) and aromatic aldehyde (m mol), water (20ml) and catalyst juice (10ml) were added and refluxed at 80°C for 2 hrs. On the other hand the same mixture was heated in microwave for 5 minutes at 70 watt. The obtained crude products 4-Chloro phenyl bis (2-phenylindolyl) methane (I), 3-Nitro phenyl bis (2-phenylindolyl) methane (II) and 2-hydroxyphenyl bis(2-phenylindolyl) methane(III) were filtered separately and re-crystallized with ethanol, dried and weighed.

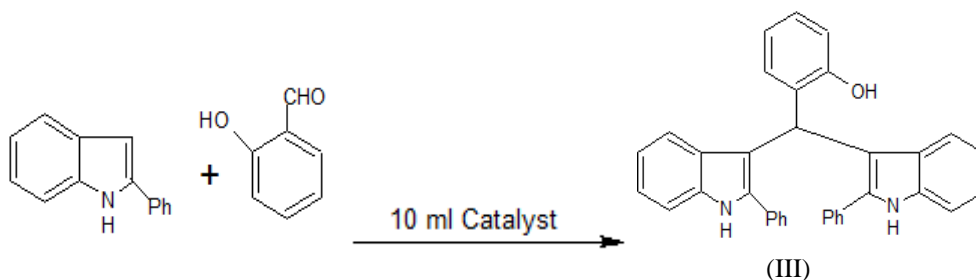
Scheme-I



Scheme-II



Scheme-III



III. RESULT AND DISCUSSION

In the last decades many synthetic schemes have been developed for the synthesis of bis indolyl methanes. However all the methods reported so far have many limitations such as expensive reagents, reaction conditions, toxic and flammable organic solvents, high reaction time and complicated procedures etc. We synthesized some substituted bis (indolyl) methanes in the absence of hazardous solvents using convenient and environmentally green methodology. The melting points of all three substituted indoles were sharp and yield of the products were satisfactory for the reflux method as compare to microwave heating. The result and catalyst used for synthesis were shown in table no-1. The synthesized compounds were confirmed by melting points and IR spectral analysis.

A. 3,3'-bis(2-phenylindolyl)-4-chlorophenyl methane (I)

IR (KBr) : Shows the presence of a peak at 3438 and 3387cm^{-1} for cyclic -NH stretching, 3053cm^{-1} for aliphatic -CH stretching, 1680 and 1598cm^{-1} for aromatic C=C group, 1350 , 1358 and 1248cm^{-1} for -C-N stretching and some peaks at 748 and 694cm^{-1} for substituted aromatic hydrogens. The peaks at 505 and 430cm^{-1} indicates the presence of aromatic -C-Cl stretching.

B. 3,3'-bis(2-phenylindolyl)-3-nitrophenyl methane (II)

IR (KBr) : Shows the presence of a peak at 3442 and 3330 cm^{-1} for cyclic –NH stretching, 3084 cm^{-1} for aliphatic –CH stretching, 1565 and 1527 for aromatic –NO₂ group, 1640 cm^{-1} for aromatic C=C group, 1444, 1348, 1257 and 1151 cm^{-1} for –C-N stretching and some peaks at 810 and 694 cm^{-1} for substituted aromatic hydrogens. The peaks at 748 cm^{-1} indicates the presence of aromatic –C-Cl stretching.

C. 3,3'-bis(2-phenylindolyl)-2-hydroxyphenyl methane (III)

IR (KBr) : Shows the presence of a peak at 3387 cm^{-1} for aromatic –OH stretching, 3057 cm^{-1} for aliphatic –CH stretching, 1598 cm^{-1} for aromatic C=C group, 1307, 1263 cm^{-1} for –C-N stretching and some peaks at 920, 833, 817, 752, 698, 617 cm^{-1} for substituted aromatic hydrogen.

Table no-1: Result and catalysts used for synthesis.

Sr. No	Catalyst (Juice)	p ^H	Reflux 80 ^o C 2Hr			MW 5min 70Watt			M.P. of Product (^o C)		
			I	II	III	I	II	III	I	II	III
1	Amla	4.9	85.14	85.76	68.36	58.49	66.35	66.30	124	146	135
2	Pineapple	3.36	61.38	86.53	78.00	47.52	48.07	59.00	122	140	136
3	Tamarind	1.73	87.21	91.44	83.97	51.48	40.86	51.10	122	140	140
4	Sweet lemon	2.72	48.51	61.73	70.70	38.61	36.53	53.06	128	139	138
5	Butter milk	2.86	49.50	81.34	91.80	35.64	54.23	51.02	130	145	139
6	Citrus limetta	2.38	70.29	61.73	81.00	54.45	53.94	65.80	126	144	132

IV. CONCLUSION

The present study reveals that the synthesis of bis (2-phenyl indonyl) methanes from some aromatic aldehydes using various natural acid catalyst was efficient with refluxing the mixture compared to the microwave assisted synthesis.

REFERENCES

1. Pore, D M., Desai, U V, Thopate, T S and Wadgaonkar, P P. A mild, expedient, solventless synthesis of bis(indolyl)alkanes using silica sulfuric acid as a reusable catalyst. ARKIVOC, (xii), 75-80, 2009.
2. Suhana, H and Premkumar, G. Synthesis of bis(indolyl)methane using tetrabutyl ammonium hydrogen sulphate in aqueous medium-Green approach. Int. J. Ad. Chem. Sci. and App., 2 (2), 31-34, 2014.
3. Shaikh S, Shaikh N, Zamir M, Salunke S D and Baseer M A. Synthesis of New 2-Substituted Phenyl-1H-Indoles via Fischer Indole Reaction. Chem Sci Trans., 2(2), 584-588, 2013.
4. Ahmed M Z, Khillare C B and Ahmed S K. Synthesis of Bis(indolyl)methanes. A Natural Approach. Chem Sci Trans., 2(4), 1513-1517, 2013.
5. Pal R., Khannobis S and Sarkar T320. First Application of Fruit Juice of Citrus limon for Facile and Green Synthesis of Bis- and Tris (Indolyl) Methanes in Water. Chemistry Journal., 3(1), 7-12, 2013.
6. Sheikh A and Nazeruddin G M. Grape juice Catalysed Synthesis of Bis (Indolyl) Methanes in aqueous medium, A Green Approach, J Chem and Pharma Res., 8(4), 224-228, 2016.
7. Rajendran A, Raghupathy D and Priyadarshini M. A Domino Green Synthesis of Bis(indolyl)methanes Catalyzed by Ionic Liquid [Et₃NH][HSO₄], Int J Chem Tech Res., 3(1), 298-302, 2011.
8. Behbahani F K and Sasani M. Facile synthesis of bis(indolyl)methanes using iron(III) phosphate, J. Serb. Chem. Soc., 77 (9), 1157-1163, 2012.