

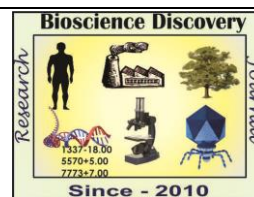
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Research Article



Microwave Assisted Synthesis and Characterization of Novel Schiff Base Ligand Derived From 2-Amino 5, 6 Dimethyl Benzimidazole with Isophthalaldehyde

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Abstract

Novel Schiff base ligand was synthesized by using Scientific Microwave oven. The novel Schiff base was derived from 2-amino5,6 Dimethyl benzimidazole and Isophthalaldehyde. The Structure of Schiff base was elucidated by elemental analysis, IR, ¹H-NMR and LC-MS. The novel Schiff base was a colored compound and stable in air. The characterization results confirm the formation of predicted novel Schiff base ligand.

INTRODUCTION

Novel Schiff bases have been studied in the field of Coordination Chemistry due their simple synthesis, easy availability, electronic properties and good solubility in common solvents (Sharma *et al.*, 2010). The co-ordination chemistry of nitrogen-oxygen donor ligands is an interesting area of research. Such ligands and their complexes due to a better understanding of metal protein binding have been of great interest for many years (Ganguli *et al.*, 2015).

Microwave-assisted synthesis belongs to green chemistry due to so many factors like less reaction time, maximum yield and so on. The application of microwave assisted synthesis in organic, organometallic and co-ordination chemistry continues to develop at an astonishing pace (AbdelAziz *et al.*, 2017). Microwave-assisted reaction under solvent free or less solvent condition offer reduced pollution, low cost and better yield and ease in processing and handling (Sun *et al.*, 2010). In microwave assisted organic synthesis,

accidents during boiling, toxic and poisonous solvents are frequently avoided (Gopalkrishna *et al.*, 2007 and Maji, 2018). The use of microwave irradiation for the synthesis of drugs and organic compounds has proved to be effective, safe and environmentally nonthreatening techniques with shorter reaction time (Guzen *et al.*, 2007). The prominent features of microwave irradiation technique are lesser reaction times, simple reaction conditions and enhancements in yields (Shinde *et al.*, 2014). Compounds containing azomethine group (-HC=N-) are known as Schiff base (Mishra *et al.*, 2012). They are condensation products of ketones or aldehydes with primary amines and were first reported by Hugo Schiff in 1864 (Marcon *et al.*, 2002). Schiff bases are biological active compounds and show a lot of biological activities such as anticancer (Yadav and Mani, 2015), plant growth inhibitors (Aras *et al.*, 2009) insecticidal (Prakash and Adhikar, 2011), antidepressant (Kiruthi and Chandra, 2013), antibacterial (Kobasashi *et al.*, 2011), anti-inflammatory (Masson *et al.*, 2013),

anti-tuberculosis (Kumar *et al.*, 2017), antimicrobial (Allen and Tidwell, 2012) and anticonvulsant activity (Sriram *et al.*, 2006). In the present paper, we have described synthesis and spectral analysis of novel Schiff base ligand derived from the irradiation of 2-amino-5,6 Dimethyl benzimidazole and Isophthalaldehyde, which may help in more understanding of the mode of chelation of ligands towards metals.

MATERIAL AND METHODS

All chemicals were purchased from the sigma Aldrich including 2-amino-5,6 Dimethyl benzimidazole, Isophthalaldehyde and other chemicals were purchased from Loba Chem & Merck. All the chemicals were used as received. The Schiff base was prepared by the irradiation of the aldehyde and amine mixture in the 1:2 molar ratios in scientific microwave oven.

Techniques:

Microwave assisted syntheses were performed in a scientific microwave oven of 2450 MHz frequency

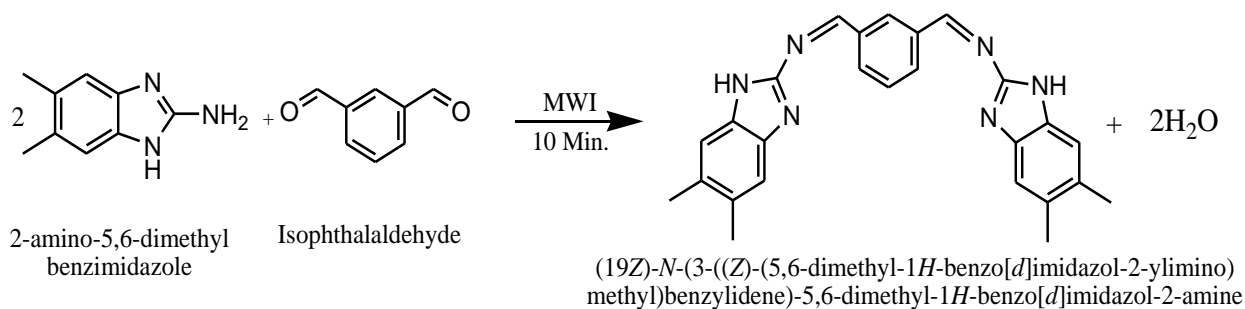


Fig 1: Showing the formation of ligand

RESULTS AND DISCUSSION

As a result of green synthesis, it was observed that the reaction time was shorter with higher yields. In the microwave method homogeneity of reaction mixture was increased by the rotating of reaction platform tray. The confirmation of the results was also checked by the repeating of the synthesis process. The microwave irradiation technique was completed within short time and yield obtained was

90%. The synthesized novel Schiff base ligand was a colored compound, solid and stable towards air and moisture at room temperature. It possess sharp melting points and insoluble in common organic solvents but soluble in DMF and DMSO.

Elemental composition analysis:

The elemental analysis (CHN) data for the novel ligand and its metal complexes are summarized below in the Table 1.

Table 1: Elemental composition analysis data

Empirical Formula	Mol. wt.	C Found (calc.) %	H Found (calc.)%	N Found (calc.)%
C ₂₆ H ₂₄ N ₆	420	73.71 (74.28)	06.00 (05.72)	20.29 (20.00)

Physical properties:

The details of physical properties of the novel Schiff base ligand is summarized in Table 2.

Infrared spectral analysis:

IR spectra of Schiff Base ligand show a broad band around 3452 cm⁻¹ which is attributed to NH stretching vibration of benzimidazole moiety. IR spectrum of the Schiff base ligand showed the most characteristic bands at 1670 cm⁻¹ due to azomethine stretching $\nu(\text{C}=\text{N})$ (Prashanti and Raj, 2010). (C-H) stretching observed at 3064 cm⁻¹.

¹H-NMR Spectral Studies of Schiff base:

The ¹H-NMR Spectra of Schiff base are given some signals which are summarized in Table 4. The ¹H-NMR spectrum for Schiff base showed a peak at 9.52ppm (s, 1H, N=CH), the multiple signals within the 8.72-6.87ppm range are assigned to the aromatic protons of both rings. N-H proton of benzimidazole ring shows a peak at 5.91 ppm and H-from methyl proton at 2.50 ppm (Venkatraman, 2013).

Table 2: Physical properties of novel ligand

Sr. No.	Molecular Formula	Colour	M.P.(°C)	Time (minutes)	Yield (%)
1	C ₂₆ H ₂₄ N ₆	Dark Yellow	154	10	90

Table 3: Selected Infrared Frequencies (cm⁻¹) of novel Schiff base ligand

Ligand/Complexes	$\nu(\text{C}=\text{N})$ Azomethine	$\nu(\text{N-H})$	$\nu(\text{C-H})$
C ₂₆ H ₂₄ N ₆	1670	3452	3064

Table 4: The ¹H-NMR peak data of novel ligand

Compound	H - for from azomethine group	H-from aromatic group	N-H Proton of benzimidazole Ring	H-from methyl proton
novel Schiff base ligand	9.52ppm	8.72-6.87ppm	5.91ppm	2.50ppm

Mass Spectral studies:

The mass spectrum of the Schiff base showed the molecular ion peak at m/z 422 (M+2) that corresponds to the molecular weight of the Schiff base ligand 420.

CONCLUSION

In the present work, we have synthesized a novel Schiff base ligand; (19Z)-N-(3-((Z)-(5,6-dimethyl-1H-benzo[d]imidazol-2-ylimino)methyl)benzylidene)-5,6-dimethyl-1H-benzo[d]imidazol-2-amine by the Microwave assisted method. The synthesized novel ligand was characterized by spectral analyses. In the result of microwave-assisted synthesis; it has been observed that the reaction time decreased from hours to minutes with better yield. This method is simple, economical and eco-friendly from green chemistry approach.

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