

Preparation and Characterization of the ligand “bis(pyridyl) benzilidene” (BPB)

¹Dr. M. V. V. Ramanjaneyulu, ²A. V. R. Gajapathi Raju, ^{3*}Dr. N. Vijaya Kumar, ⁴Dr. T. Sreevaram

¹Lecturer in Chemistry, KGRL (A) College, Bhimavaram-534201, AP, India
²& ³Lecturers in Chemistry, DNR (A) College, Bhimavaram-534202, AP, India
⁴Lecturer in Chemistry, Govt. Degree College, Ravulapalem-533238, AP, India
*Corresponding author: nethalavk[at]gmail.com

Abstract: Coordination compounds have always been playing an important role in human life. A coordination compound consist central metal ion and ligands. The ligands are classified in different ways, based on charge and denticity. In the present study a tetra dentate ligand Bis-(pyridyl)benzilidene (BPB) was prepared and characterized by microanalysis, UV and FT-IR, melting point, and TLC methods.

Key words: Coordination compounds, ligand, Bis-(pyridyl)benzilidene, UV and FT-IR Spectrum

1. Introduction

Coordination compounds have always been a challenge to the inorganic chemists. In early days these compounds seemed to be unusual (hence the name “complex” ions) which defy the rules of valence. The modern study of coordination compounds begins with Alfred Werner (1893) and Sophus Mads Jorgensen.

Coordination chemistry pertains to the complexity of the compounds, which do not exist as individual, but as related groups often surrounding a metal ion in the center. The groups that are bound to the central metal ion in a symmetrically oriented fashion are called ligands. For a long time, the coordination compounds were considered as a rare and special class of compounds, but later they have been recognized as the most resorted type of compounds which help the nature to convert the simple inorganic molecules into complex organic matter. For instance, in the conversion of carbon dioxide and water into carbohydrate in the plants, a coordination compound called chlorophyll [Mg²⁺ complex][1, 2] plays an important role. A similar iron complex known as haemoglobin[3, 4] operates in the red blood cells as carrier of oxygen.

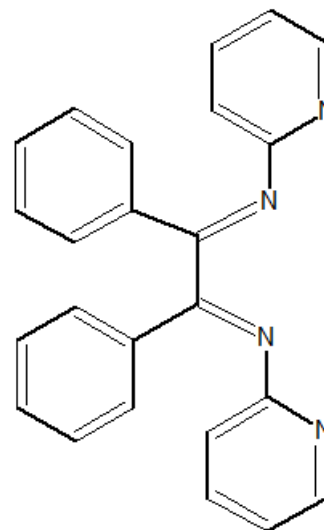
Ligands:

Coordination compounds are conveniently formulated as consisting of a central atom or ion, surrounded by a set (usually 2 to 9) of other atoms, ions or groups, latter being called ligands e.g. NH₃, Cl, CO etc., ligands may be negative (Cl⁻), positive (NO⁺) or neutral (NH₃). Ligands are classified on the basis of number of donor atoms present in the ligand attached to the central atom or ions,

like monodentate (NH₃), bidentate (en), tridentate (terpyridine) and tetradentate (triethylene tetraamine) etc.

Structure of the ligand:

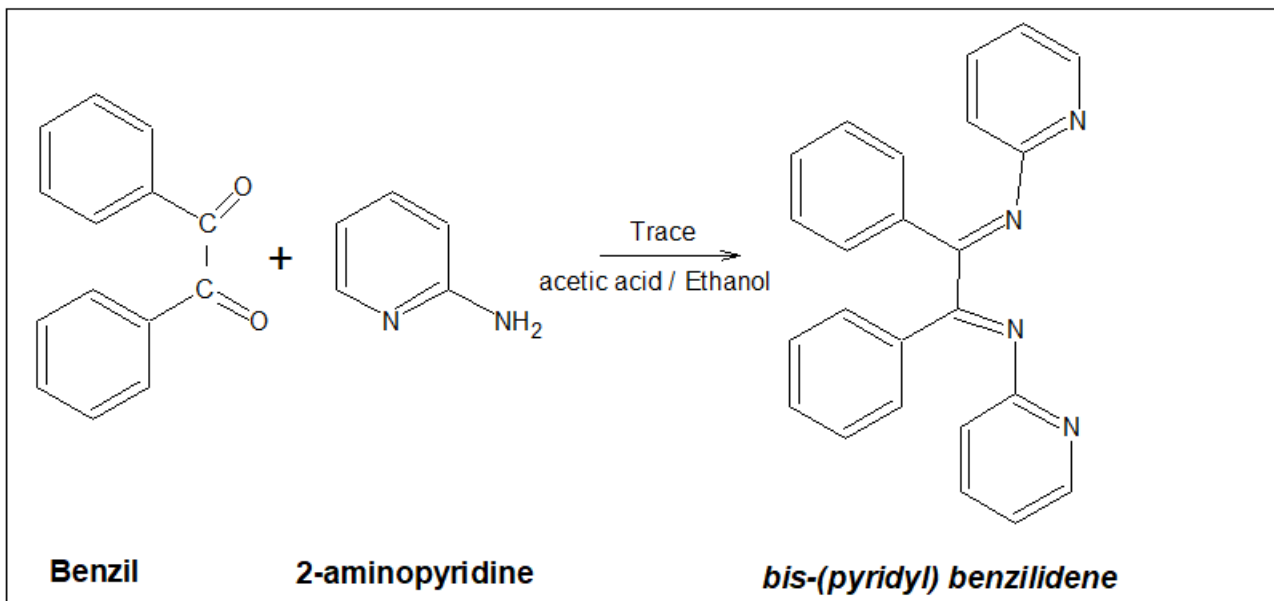
Structure of the ligand BPB is



Bis-(pyridyl)benzilidene

Experimental:

1:2 mole ratio of benzil (0.01 mol) and 2-aminopyridine (0.02 mol) were treated with 1 to 2 drops of acetic acid in 100 ml of rectified spirit. The mixture was refluxed for 10 hrs. The mixture was cooled to room temperature and poured into de-ionised water. The colourless product was filtered in a buckner funnel, dried and recrystallized from benzene pyridyl (40 – 60°C). Yield was 50% (MP 79°C). The purity of the product was checked by TLC method.



Scheme 1

2. Results and Discussion

Characterization of the ligand:

Microanalyser, UV and IR techniques were used for characterization of the ligand (primary) BPB. Microanalysis of the ligand BPB was determined by CHN analyzer, %C = 79.0 (79.55); %H = 4.92 (4.97) and % N = 15.34 (15.46). The UV spectrum was recorded on a SHIMADZU UV 1650PC UV-Visible spectrophotometer, using a quartz cell (1 cm), in ethanol medium. IR spectrum was recorded on a AVATAR 330 FT-IR thermo Nicolet spectrophotometer in KBr pellets.

UV - spectral study of the BPB:

Condensation of benzil and 2-aminopyridine was confirmed after comparing the ligand spectrum with those of starting materials. The keto group of benzil exhibits a band around 285 nm in ethanol medium. This band is disappeared and two new bands are appeared in the ligand at 301 and 245 nm (Figure 1). This indicates that $n \rightarrow n^*$ and $\pi \rightarrow \pi^*$ exist in the ligand[5].

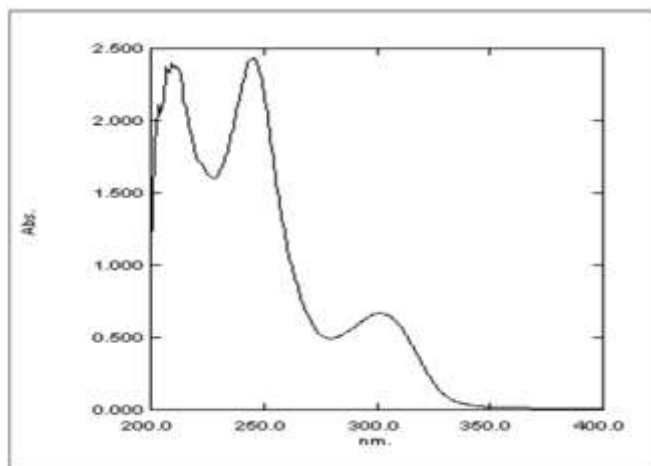


Figure 1: UV-Spectrum of BPB in Ethanol

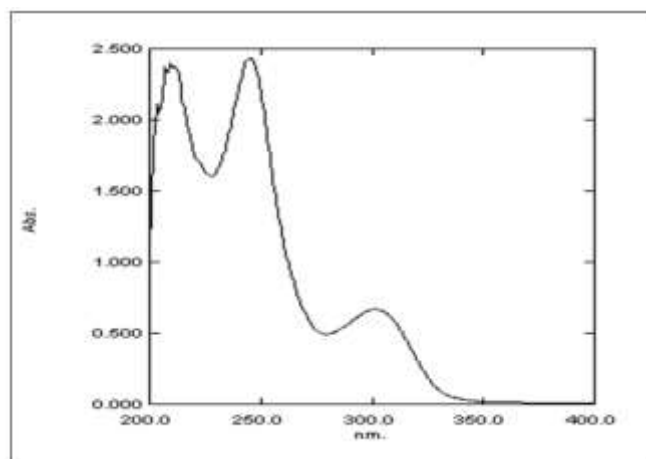


Figure 2: UV-Spectrum of BPB in Ethanol

FT-IR spectral study of the BPB:

FT-IR spectrum of primary ligand is displayed in Figure 3

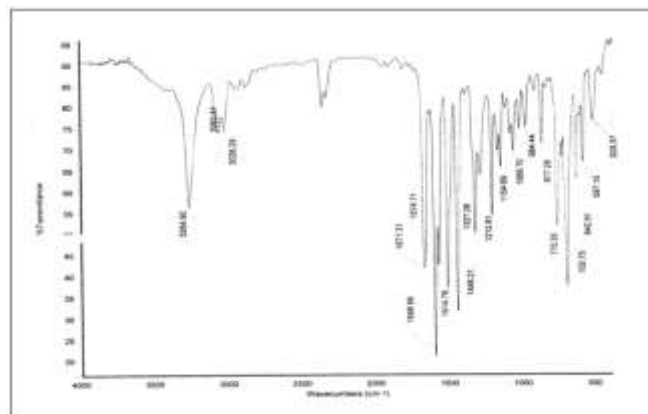


Figure 3: FT-IR Spectrum of BPB in KBr Disc

A strong band appeared at 3264 cm^{-1} assigned to ν_{OH} a band at 3062 and 3026 cm^{-1} ascribed to CH stretching vibration of phenyl and pyridyl ring[6]. A sharp intense band at 1671 cm^{-1} is assigned to azomethine group present in the compound. A strong intense band at 1598 cm^{-1} and

1574 cm^{-1} indicates the C-N stretching vibration. A band at 702 cm^{-1} is attributed to stretching vibration of CH in phenyl and pyridyl ring.

3. Conclusions

The ligand *bis*(pyridyl)benzilidene was prepared from condensation of benzil and 2-aminopyridine. The ligand was characterized by microanalysis, UV and FT-IR, melting point, and TLC methods.

References

- [1] L.P. Vernon and G.R. Seely, eds., The chlorophylls, Academic Press, New York.
- [2] R. Timkavich and Tulinsky, *J. Am. Chem. Soc.*, 91, 4430, 1969.
- [3] J.H. Wang, *Acc. Chem. Res.*, 3, 90, 1970.
- [4] J. Bjerrum, "Metal Ammine Formation in Aqueous Solution" P. Hasse and Son, Copenhagen, 1941.
- [5] C.N.R. Rao, Ultraviolet and Visible Spectroscopy Chemical Application, Butterworths, London, 10, 1961.
- [6] Nagamooto, Infra Red Spectroscopy.

Authors Profile



Dr. M. V. V. Ramanjaneyulu has been working as a lecturer at K.G.R.L Degree College, Bhimavaram since 1993. He completed M.Sc. in 1990 from Kanpur University, Kanpur, India and he was awarded Ph.D. in 2014 from Andhra University, Visakhapatnam, India.



A. V. R. Gajapathi Raju received his M.Sc. degree in Chemistry from Indian Institute of Technology, Roorkee, India in 1985. Since then he has been teaching Chemistry to the undergraduate students at D.N.R. College (Autonomous), Bhimavaram, India



Dr. N. Vijaya Kumar received his M.Sc. degree from Nagarjuna University, Guntur, India in 1995 and Ph.D. from Andhra University, Visakhapatnam, India in 2012. Since 2002 he has been working as a Lecturer in Chemistry, D.N.R. (Autonomous) College, Bhimavaram, India



Dr. T. Sreevaram received her M.Sc. degree from Nagarjuna University, Guntur, India in 1994 and M.Phil from Annamalai University, Chidambaram, India in 2008. She has been working as a Lecturer in Chemistry, Govt. Degree College, Ravulapalem, India