REVIEW OF SPECTROSCOPIC INVESTIGATION ON FUNDAMENTAL MODES OF PICOLINIC ACID HYDRAZIDE

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Abstract

During this paper synthesis of (E)-3,4-dichlorobenzylidene picolino hydrazide using 3,4 - trimethoxybenzaldehyde and thio semicarbazide and This work is very effective medicinal hydrazide derivatives are synthesized from Schiff base route. Fourier transform infrared (FT-IR) spectra shows the chemical bonding and various functional groups, the carbonyl peak appeared at 1658, 1649 and 1656 cm−1 in pure pyrazineamide compounds, respectively. 1H and 13C nuclear resonance analysis examines the location of aromatic protons and carbons are identified to the synthesized materials. The spectrophotometric data just like the transmittance was cogitated within the 350-2500 nm regions and were found.

Introduction

Compounds with the structure of –C=N–(azomethine group) are referred to as Schiff bases, which are usually synthesized by condensation of primary amines and active carbonyl groups. Schiff bases are a crucial class of compounds within the medicinal and therefore the pharmaceutical field. More- over, Schiff bases have found application in drug development for the treatment of hypertension, HIV infection and are shown to exhibit a broad range of biological activities, including antifungal, antibacterial, antimalarial, antiproliferative, antiinflammatory, antiviral, and antipyretic properties (1).

A Schiff base (-C=N-R) may be a nitrogen analog of an aldehydes or ketones during which the C=O group is replaced by amine group. it's usually formed by condensation of an aldehydes or ketones with a primary amine and that they are explained with schemes. Tuberculosis (TB) is presently considered the foremost dangerous infective disease world- wide and one among the main AIDS associated infections. at the present , consistent with statistics, TB kills four people every minute somewhere within the world and accounts for about two million deaths per annum . it's estimated that one-third of the world's population is currently infected with the TB bacillus and 30 million people

will die within the next 10 years. For the event of latest antimycobacterial compounds Turan-Zitouni et al.(8) synthesized new thiazolylhydrazone derivatives by the reaction of thiosemicarbazide with acetophenone derivatives. Hydrazones possess an azometine -NHN=CH- proton that has found wide utility in organic synthesis. 1-2 While hydrazones have traditionally been employed as moiety for the derivatization and characterization of carbonyl compounds, in recent years the N-N linkage has been used as a key structural motif in various bioactive agents. Hydrazide-Hydrazone derivatives containing –NHN=CH- moiety represent an over whelming and rapid developing field in modern medicinal chemistry. Reported data indicade that hydrazide derivatives have significant biological activities like anti-inflammatory

METERIALS AND METHODS

Characterization techniques used:

Some physical methods were wont to elucidate the bonding and structure of the synthesized ligands and complexes and to verify the expected properties. While the ligands were characterized by usual methods like analytical technique like TLC, molar conductance, magnetic susceptibility and spectral techniques like IR, UV-Visible, NMR and mass spectral techniques, it differs for complexes counting on the character of the ligands and therefore the metal ions involved. The presence of paired or unpaired electrons of the metal ions imparts the magnetic behavior of the complexes.

Chemicals used as

All the chemicals used were of Merck and Sigma Aldrich products, available commercially in AR grade. The purchased chemicals were used with none further purification.The physicochemical techniques employed for this study is discussed below.

Spectral methods:

Infrared spectroscopy:

Most of the spectra give sufficient information about the structure of the compound. The Infra Red spectrum is one among the spectra. The absorption of Infra-Red radiations causes the varied bands during a molecule to stretch and bend with reference to each other .The IR spectroscopy is widely used as a characterization technique for metal complexes. the essential theory involved is that the stretching modes of the ligands

changes upon complexation thanks to weakening or strengthening of the bonds involved within the bond formation leading to subsequent change within the position of the bands appearing within the IR Spectrum. The changes within the structural features of the ligands are observed as changes in bands observed, mainly within the fingerprint region (4000-400 cm-1). The bands thanks to the metal ligand bonds are mainly observed within the far IR region (600-100 cm-1). within the present study, IR spectra of the compounds were recorded using Perkin Elmer spectrum RXI using KBr pellets at frequency range 4000-400 cm-1at ACIC, St. Joseph′s College (Autonomous), Trichirapalli and Shimadzu FT IR 400 Spectrophotometer, frequency range 4000-400 cm-1 using KBr disc at St Joseph's College, Trichy.

Nuclear Magnetic Resonance spectroscopy:

NMR spectra analysis:

In ^{1}H NMR spectrum, the proton attached to C2 & C7 carbon showed as a singlet at δ = 8.26 and 8.31 ppm. It was the unique proton appeared as a sharp singlet without multiplicity and used to calibrate other peaks. The characteristic amine N-H was appeared as broad singlet at δ = 7.86 ppm. The three protons attached on the phenyl ring were appeared as two doublets at δ = 7.59 and 7.67 ppm and one singlet as discussed early. On the other hand, the four protons associated with pyridine ring were identified as two doublets at δ = 8.36 & 8.68 ppm and two multiplets at δ = 7.80 & 8.08 ppm. The detailed assignments of protons were given in table 2 and figure 2. 1H NMR spectrums showed signals in the range 8.3 ppm, and these signals were the evidence of the secondary amide bonding to the ligand [42].

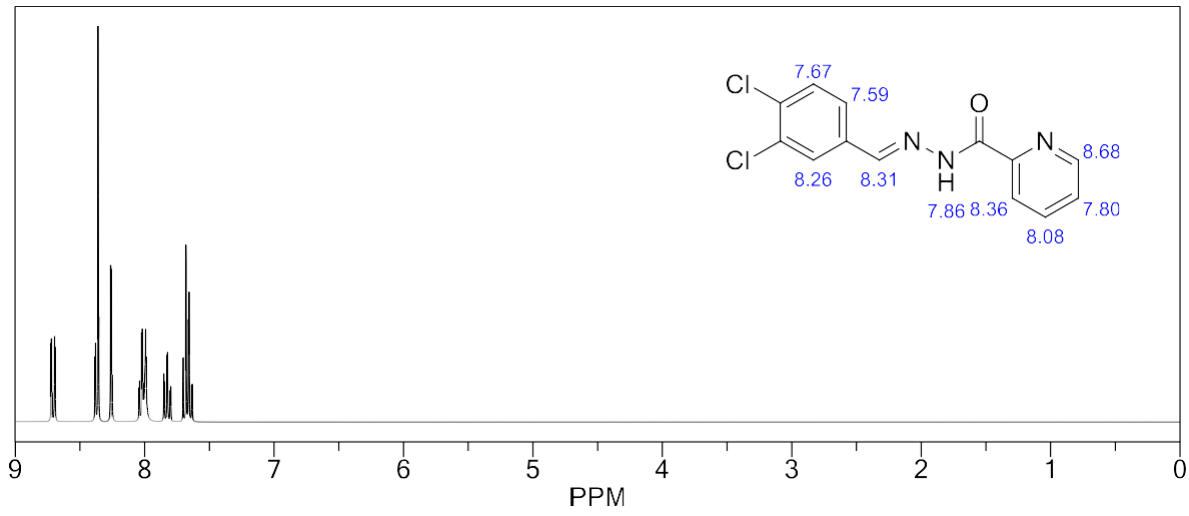


Figure 2. ^{1}H NMR spectrum of (*E*)-*N*'-(3,4-dichlorobenzylidene)picolinohydrazide

In ^{13}C NMR spectrum, the discernible amide carbonyl appeared at δ = 157.6 ppm and it clearly indicates that molecule having amide group on its skeleton. Next, the carbon attached to the adjacent to the nitrogen atom on pyridine ring was appeared at δ = 151.3 and 147.6 ppm. The newly formed imine carbon peak appeared around at δ = 146.8 ppm. The chlorine attached quaternary carbon appeared at δ = 133.5 and 135.7 ppm. The remaining six C-H carbons are showed six signals in the range of δ = 122.1 to 147.6 ppm. Peak assigning of other carbons was showed in table 2 and figure 3.

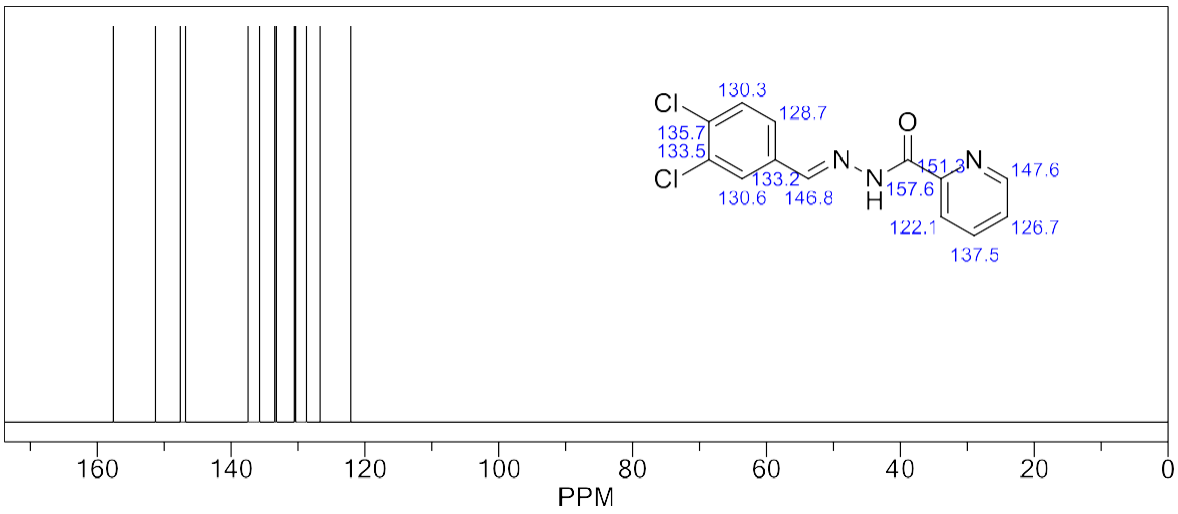


Figure 3. ^{13}C NMR spectrum of (*E*)-*N*'-(3,4-dichlorobenzylidene)picolinohydrazide

SYNTHESIS OF (3,4-DICHLORO BENZALDEHYDE) PYRIDINE DICARBOXYLIC ACID HYDRAZIDE

CHEMICALS REQUIRED:

3,4 dichlobenzaldehyde (0.8750mol) =2.5

Pyridinedicarboxylicacidhydrazide(0.6857)

=1.4 Ethonal=10ml

water =10ml

3,4, dicholoro benzaldehyde and pyridine di acid hydrazide absorb 1;1 molar ratio.1.4g of pyridinedi acid hydrazide(0.6857mole) was taken during a round bottom flask and 40ml of ethanol was added .To this solution.10ml ethanolic solution of two .5g of 3,4dicholoro benzaldehyde(0.8750mole) was added and stirred well for one hour by keeping the reaction mixture on a magnetic stirrer. After one hour a crude solid was obtained (scheme3).this crude solid was washed with water two to 3 times and dried then finally washed with ether and kept in over

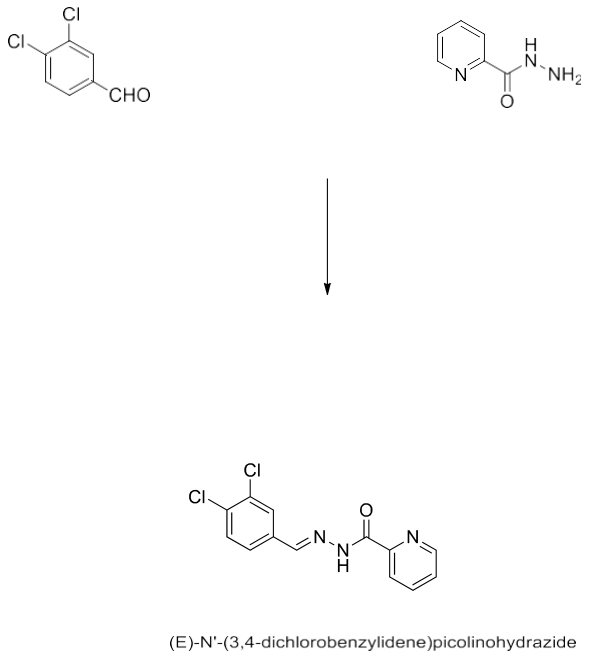


Figure 1. schematic representation of synthesis of hydrazide

RESULT AND DISCUSSION

5.1 A completely unique monosubstituted dipicolinic acid hydrazide derivative 3,4-Dichloro Benzaldehyde) Pyridine Dicarboxylic Acid Hydrazide was synthesized by schiff base reaction. Formation of discrete white powdere redisolved and crystaliesed compound (plate 1) was used for further characterization. The Hydrazide base derivatives are soluble in common organic solvents. The analytical data and physical properties of the Substituted chloro pyridine Hydrazides solubility listed in Table No. 1. Under RT it found to be soluble in water and hexane only but under hot condition the results were the other way around it's insoluble in predicament and hexane but soluble in methanol, ethanol(plate 2). the basic analsis(table 2) showed Presence of nitrogen, halogen, chlorine. The crystalised compound shows purity and detected by TLC. Single fraction was detected under 365 nm and therefore the Rf value isn't varied among solvent and located to be on the brink of 0.84-0.95(plate 3). the basic analysis reveals presence of nitrogen halogen and chlorine

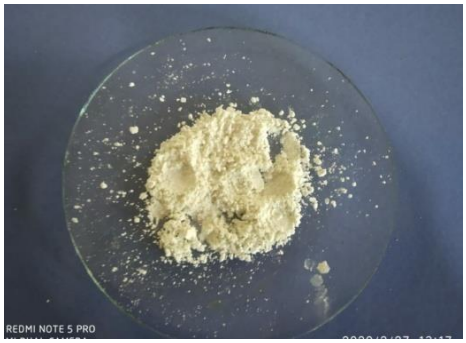


Plate 1. Compound

Plate 2. Solubility of compound

plate 3. TLC of synthesized hydrazide

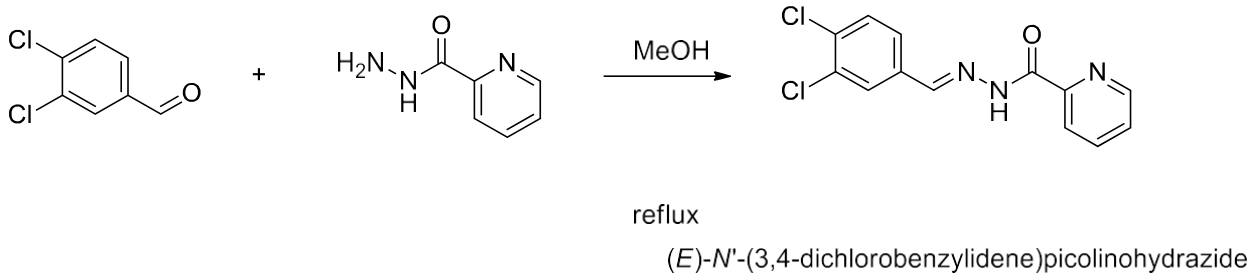
Table 1.solubility and *Rf* value of compound Vs solvent

S.no.	**Solvents**	**Room temperature**	**Hot condition**	**Rf value**
1	Water	Soluble	Insoluble	-
2	Methanol	InSoluble	Soluble	0.94
3	Ethanol	Insoluble	Soluble	0.93
4	Hexane	Soluble	Insoluble	-
5	Benzene	Insoluble	Soluble	0.91
6	Ethyl acetate	Insoluble	Soluble	0.92
7	Chloroform	Insoluble	Soluble	0.79
8	Dimethylsulphoxide	Insoluble	Soluble	o.94
9	Dichloromethane	Insoluble	Soluble	0.84

Table 2. Elemental analysis of hydrazide derivative

Test	Report
Test for nitrogen	Presence of nitrogen
Test for halogen	Presence of halogen
Test for sulphur	Absence of sulphur
Test for chlorine	Presence of chlorine
Test for bromine	Absence of bromine
Test for iodine	Absence of iodine

Spectral Characterization



reflux

(*E*)-*N*'-(3,4-dichlorobenzylidene)picolinohydrazide

Spectral Characterization:

FT-IR Spectral studies:

In order to review of functional group of the synthesized Schiff base, the IR spectrum was compared with the overall functional ranges. The IR spectrum of Schiff base showed characteristic broad band at 3433 cm-1 are often attributed to ν(N-H) and aromatic ν(ArC-H) stretching vibrations appeared at 3037 cm-1. it's indicated, the Schiff base also having intermolecular O…H hydrogen bonding. The weak force was depends on the concentration of the answer . during this spectrum was recorded with very dilute sample. Another distinctive vibration expected for N-N observed at 1932 cm-1. Generally group stretching vibrations appears at 1680-1700 cm-1 but during this case appeared at 1627 cm-1; this is often thanks to amide group present within the compound which decreases the carbonyl functional group. The newly generated C=N stretching vibration appeared at 1456 cm-1 along side other finger print region signal and every one other peaks are good agreement with the proposed structure. The FT-IR spectral data are given in table 3 and figure 1.

Table 3 Important IR bands of Schiff base with their assignments.

Vibrations	ν(N-H)	ν(ArC-H)	ν(N-N)	ν(C=O)	ν(C=N)

Peak (cm^{-1})	3433	3037	1932	1627	1456

Figure 1. FTIR spectrum of (*E*)-*N*'-(3,4-dichlorobenzylidene)picolinohydrazide

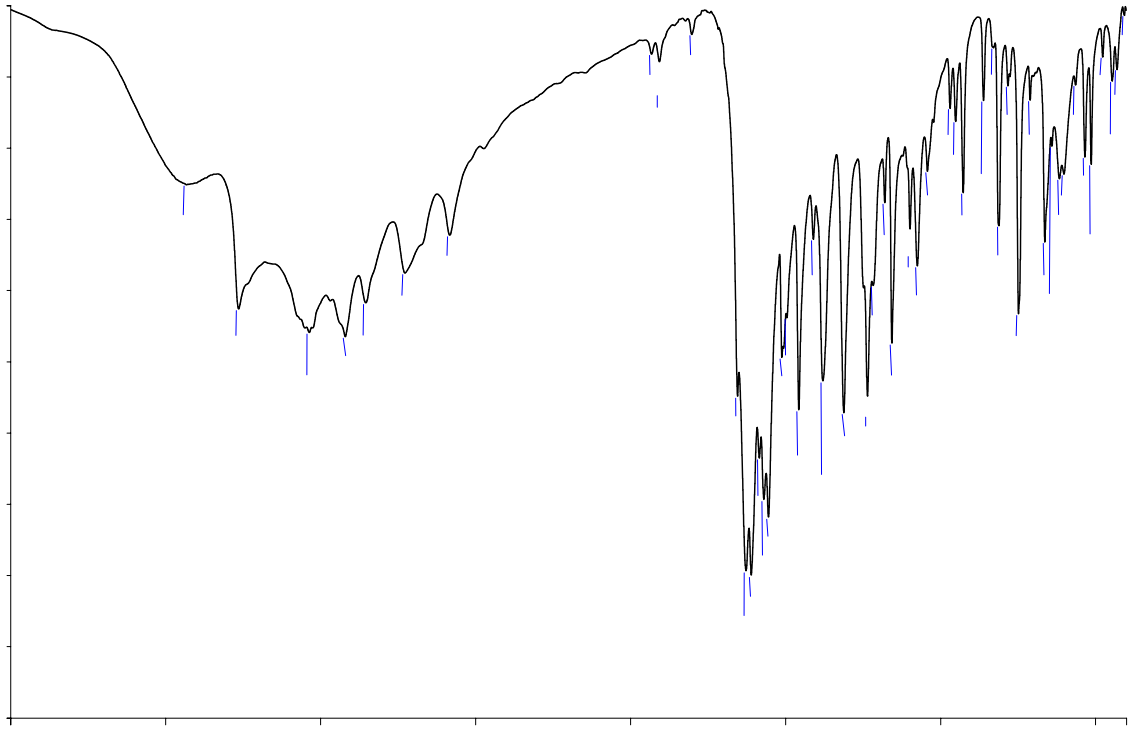


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Table 2. NMR spectroscopic data (δ) of (*E*)-*N*'-(3,4-dichlorobenzylidene) picolinohydrazide

S. No	Position Assignment	^{1}H (δ, ppm)	^{13}C(δ, ppm)
1	1	--	133.2
2	2	8.26, s	130.6
3	3	--	133.5
4	4	--	135.7
5	5	7.67, d	130.3
6	6	7.59, d	128.7
7	7	8.31, s	146.8
8	8	--	--
9	9	7.86, br	--
10	10	--	157.6
11	1’	--	--
12	2’	--	151.3
13	3’	8.36, d	122.1
14	4’	8.08, m	137.5
15	5’	7.80, m	126.7
16	6’	8.68, d	147.6

UV ANALYSIS:

Figure 4 shows UV-visible absorption spectra of (*E*)-*N*'-(3,4-dichlorobenzylidene)picolinohydrazide in DMSO which exhibit absorption bands at 256 nm. Normally, pyridine absorbs at visible region and its linked with other azo unit reduces its absorption. The longer wavelength bands can be attributed to the π-π* transitions of the (*E*)-*N*'- (3,4-dichlorobenzylidene) picolinohydrazide.

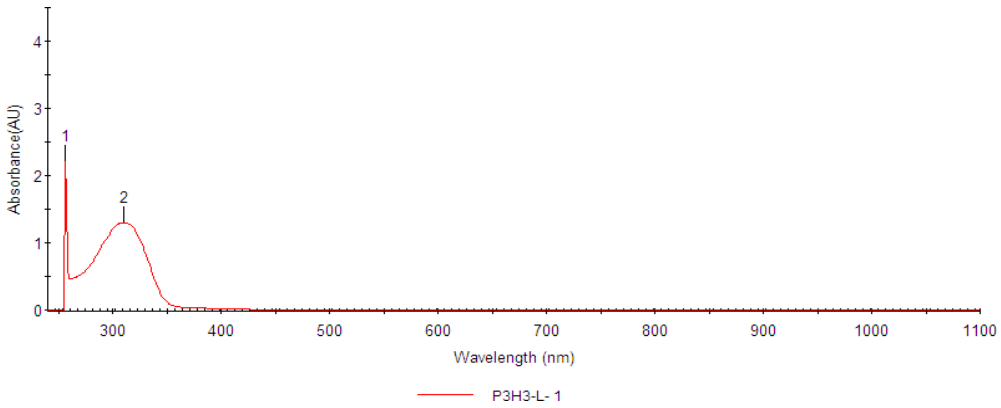

Figure 4. UV spectrum of (*E*)-*N*'-(3,4-dichlorobenzylidene)picolinohydrazide

CONCLUSION

It deals with synthesis and characterization 3,4 dichloro benzaldehyde) pyridine dicarboxylic acid hydrazide. the basic analysis shows the presence of nitrogen is confirmed by using sodium fusion extract.The FT-IR spectral study information. The frequencies around ν 3393 and 1603 cm-1 confirm the presence of amide group and thiocarbonyl group. The 1H and 13C NMR spectral studies of the ligand THC. The signals appeared in both the spectra give the precise position of every proton and carbon respectively needless to say . In mass spectral study of the ligand THCis discussed. The compounds we obtained were identified on the idea of 1H NMR and 13C NMR spectroscopy. The in vitro screening of antimicrobial properties of synthesized compounds revealed a good spectrum of antimicrobial activity.schiff bases derived from of mono hydrazide showed higher antibacterial activity than the quality and also found to be synergistic with betlactam inhibitor indicate that the compound is extremely promising antibacterial agent. In my future, I even have do the biological studies like antimicrobial activities, anti-cancer activities and anti-oxidant activities for synthesized THC

Guassian Table

Geometric parameters	From single crystal	From Gaussian 09 software
Bond length (Å)		
C(1)-C(2)	1.381(3)	1.393
C(1)-C(6)	1.389(3)	1.4
C(1)-H(1)	0.93	1.085
C(2)-C(3)	1.374(4)	1.393
C(2)-H(2)	0.93	1.084
C(3)-C(4)	1.367(4)	1.395
C(3)-H(3)	0.93	1.084
C(4)-C(5)	1.388(3)	1.391
C(4)-H(4)	0.93	1.084
C(5)-C(6)	1.375(3)	1.4
C(5)-H(5)	0.93	1.083
C(6)-C(7)	1.491(3)	1.503
C(7)-O(3)	1.229(2)	1.218
C(7)-N(1)	1.346(3)	1.385
C(8)-C(13)	1.382(3)	1.399
C(8)-C(9)	1.398(3)	1.415
C(8)-N(1)	1.418(2)	1.402
C(9)-C(10)	1.389(3)	1.395

Geometric parameters	From single crystal	From Gaussian 09 software
Bond angle		
C(2)-C(1)-C(6)	120.2(2)	120.3
C(2)-C(1)-H(1)	119.9	118.9
C(6)-C(1)-H(1)	119.9	120.7
C(3)-C(2)-C(1)	120.1(2)	120.1
C(3)-C(2)-H(2)	120	120.2
C(1)-C(2)-H(2)	120	119.8
C(4)-C(3)-C(2)	120.0(2)	119.9
C(4)-C(3)-H(3)	120	120.1
C(2)-C(3)-H(3)	120	120.1
C(3)-C(4)-C(5)	120.3(2)	120.2
C(3)-C(4)-H(4)	119.9	121.1
C(5)-C(4)-H(4)	119.9	119.8
C(6)-C(5)-C(4)	120.2(2)	120.3
C(6)-C(5)-H(5)	119.9	118.8
C(4)-C(5)-H(5)	119.9	119.2
C(5)-C(6)-C(1)	119.19(19)	123.5
C(5)-C(6)-C(7)	118.71(18)	117.2
C(1)-C(6)-C(7)	121.95(18)	120.2

C(9)-C(14)	1.503(3)	1.508
C(10)-C(11)	1.379(4)	1.39
C(10)-	0.93	1.084
C(11)-C(12)	1.382(4)	1.388
C(11)-	0.93	1.084
C(12)-C(13)	1.374(3)	1.389
C(12)-N(2)	1.465(3)	1.482
C(13)-	0.93	1.078
C(14)-	0.96	1.09
C(14)-	0.96	1.09
C(14)-	0.96	1.09
N(1)-H(1A)	0.84(3)	1.007
N(2)-O(1)	1.202(3)	1.226
N(2)-O(2)	1.203(3)	1.223

O(3)-C(7)-N(1)	122.52(18)	123.5
O(3)-C(7)-C(6)	120.56(17)	121.8
N(1)-C(7)-C(6)	116.89(16)	114.7
C(13)-C(8)-C(9)	120.94(18)	120.1
C(13)-C(8)-N(1)	120.41(18)	122.1
C(9)-C(8)-N(1)	118.65(18)	117.7
C(10)-C(9)-C(8)	118.1(2)	118.7
C(10)-C(9)-C(14)	120.1(2)	120
C(8)-C(9)-C(14)	121.7(2)	121.2
C(11)-C(10)-C(9)	122.0(2)	122
C(11)-C(10)-H(10)	119	119.2
C(9)-C(10)-H(10)	119	118.8
C(10)-C(11)-C(12)	117.8(2)	117.7
C(10)-C(11)-H(11)	121.1	122
C(12)-C(11)-H(11)	121.1	120.3
C(13)-C(12)-C(11)	122.4(2)	122.9
C(13)-C(12)-N(2)	118.5(2)	118.4
C(11)-C(12)-N(2)	119.1(2)	118.7
C(12)-C(13)-C(8)	118.7(2)	118.6
C(12)-C(13)-H(13)	120.6	120.4
C(8)-C(13)-H(13)	120.6	120.9
C(9)-C(14)-H(14A)	109.5	111.9
C(9)-C(14)-H(14B)	109.5	111.8
H(14A-C14-H(14B)	109.5	107.7
C(9)-C(14)-H(14C)	109.5	110.7
H(14A)-C(14)-	109.5	107.1
H(14B)-C(14)-	109.5	107.4
C(7)-N(1)-C(8)	124.50(16)	128.7
C(7)-N(1)-H(1A)	117.0(16)	115.4
C(8)-N(1)-H(1A)	118.3(16)	115.5
O(1)-N(2)-O(2)	122.7(3)	124.6
O(1)-N(2)-C(12)	118.7(3)	117.9
O(2)-N(2)-C(12)	118.6(2)	117.4

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