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Synthesis, anrtimicrobial properties of metal complexes and its different applications

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Abstract: *The chemistry of Schiffs Base containing an active imine linkage has assumed important because of their versatility in the synthesis of many additivesand application of in the metal working fluids. Schiff base of N,N-bis-(p-dimetylaminobenzylidenediaminopropanand its metal complexes have been synthesied. All the prepared compounds were characterized by their spectral(IR, NMR) and screened for their antimicrobial activities. We have been synthesized and applied these compounds as additives in the oil based metal working fluids.In addition to these, in the formulation of cutting fluids were also included contact synthesized N-containing compounds having antifungi, antibacterial and other useful properties.*

Keywords: *antibacterial, antifungal, Schiff bases, metal complexes.*

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I. Introduction

One of the main methods for forming machine parts is machining. As noted above, it is advisable to process components metal cutting are cutting fluids (coolant). Metal working process temperature in the cutting zone can reach 960 ^{0}C or more. So far as coolants for metal cutting proposed various compositions of organic and inorganic compounds, most of which are liquids based on mineral oils. By (MWF) of oil-based meet a series of requirements: In particular, they must not cause a pronounced biological effect on the skin and respiratory system employee, when exposed to the mucous membranes have a minimal irritating effect, has low oil mist, do not contain 3,4-benzpyrene and certain other hazardous substances. The main risk factor for the health of workers with a coolant oil flow into the airways aerosol oil formaldehyde, acrolein and other products of thermal oxidative degradation of the composition used. In this connection it is important to know the molecular composition of the oil-based coolant to identify individual compounds of potential environmental pollutants. Such data are needed to create industrial environmental monitoring in the workplace. Currently, to cutting fluids, along with high efficiency, imposed stringent environmental requirements. In this connection special importance is research on the creation of clean and safe coolant. The concept of eco-friendly coolants include a technological means, the composition of which does not include compounds that have a negative impact on the environment and the health of staff. To solve this problem, it suggested to replace the environmentally harmful components into harmless components of natural origin. It should be noted that despite the availability of a wide range of different coolants, some of the commodity produced liquids are ineffective, often do not meet the requirements imposed on them, multi-component, stable enough to contain unsafe ingredients. Modern coolants contain combinations of additives for various applications. For certain high-performance coolant is the quality of the original components, scientifically grounded their content in the composition and production technology. Taking into account the above, our research oriented; to develop cost-effective, low component and environmentally friendly formulations.In addition to these, in the formulation of cutting fluids were also included contact synthesized N-containing compounds having antifungi, antibacterial and other useful properties. Composition were drawn up taking into account the analysis of the available literature data on the composition of the coolant and components of the functional purpose.We have been synthesized and applied these compounds as additives in the oil based metal working fluids.

II. Experimental parts.

Preparation of the ligand .The ligand was synthesied by the condensation ofp-dimetyl-amino-benzaldehyde with bis-aminoprophanin 1:1 molar ratio using absolute alcohol as the reaction medium. The mixture was refluxed on a water bath for 1 and a half hour and then allowed to stand overnight at room temperature. The product were crystallized from the same solvent, melting point, 112 ^{0}C, yield 65%.

The complexes of Cu (2),have been prepared by reacting ethanolic solution of metal acetates with ethanolic solutions of the ligand in the molar ratio 1:2. The solid colouredcomplexes which issperated on cooling were filtered, washed with ethanol, dried in oven, melting point, 155 ^{0}C yield in all cases 62 %.

The complexes of Ni (2) have been prepared by reacting ethanolic solution of metal acetates with ethanolic solutions of the ligand in the molar ratio 1:2. The solid coloured complexes which is sperated on cooling were filtered, washed with ethanol, dried in oven, melting point,145^{0}C yield in all cases 60 %.

The complexes of Fe (2) have been prepared by reacting ethanolic solution of metal acetates with ethanolic solutions of the ligand in the molar ratio 1:2. The solid colouredcomplexes which issperated on cooling were filtered, washed with ethanol, dried in oven, melting point, 145 ^{0}C yield in all cases 75%.

2L+M= L_2M

Antimcrobial activity of the compounds of tested against using Pseudomonas Aeruginosa, Mycobacterium lacticolium, Aspergillusniger, Cladasporiumresinale, Penicillium Chrosegenum, Chastomiumgloloodium Trichodermaviride. The sterilized (autoclaved 121^0 C for 15 min) medium (40-50^0) was poured into the Petri dishes to give a depth of 3-4 mm and allowed to solidfy. The suspension of the microorganism the steaked on plates.The paper discs impregnated with the test compounds was placed on the solidified medium.The plates were pre-incubated forth at room temperature and incubated at 37^0 C for 24 hour.

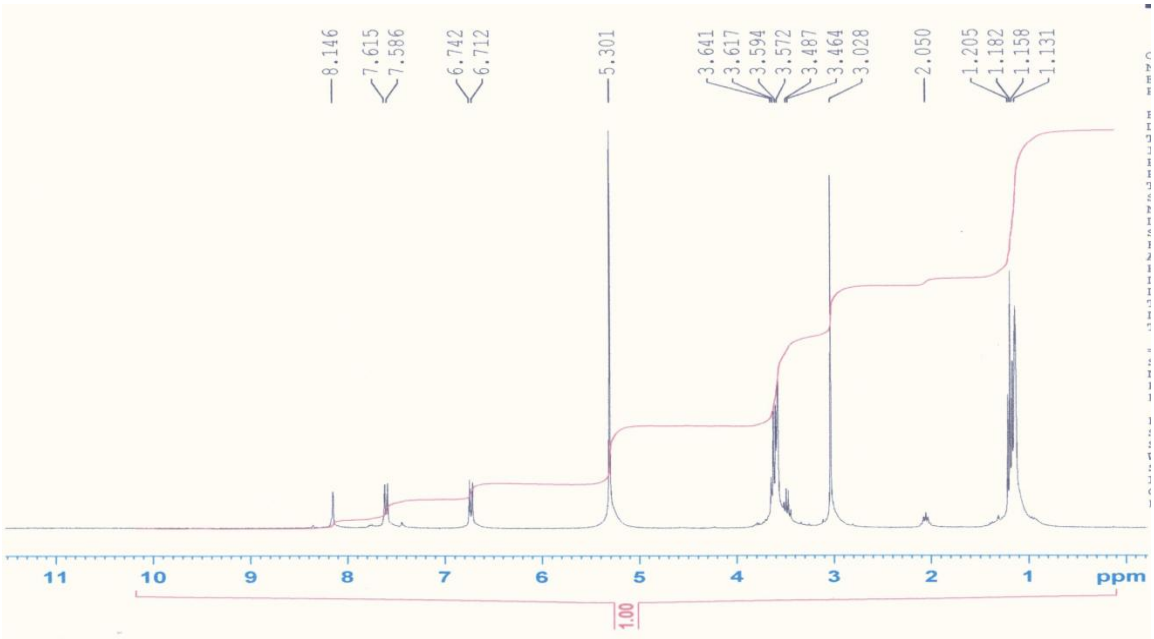


Figure 1: NMR spectrum of ligand

III. Results and Discussion.

I.R Spectra

Inthespectrum of NMR thegroup of azomethine in 8.146, $(CH_3)_2N$ 3.641-3.028-də, 4 H-2.050, CH_2 1.205-1.131 ppmobserved.

The IR spectra of the ligand exhibit strong and broad at 1650 sm^{-1} assignable to $\nu_{C=N}$ .The band is shifted to lower wave number after complex formation proposes involvement of azomethine N in the bonding with metal ions. The linkage with N atom is further supported by the appearance of a bond in far IR region at 425-395 cm^{-1} in the complexes assignable to $\nu_{M=N}$. This bond undergoes to shift after complex formation propose coordination of metal ion throughcarbonyl oxygen. It is further supported by the appearance of a new far IR band at 525-505 cm^{-1} in the complexes which is assignable to ν_{M-O}.

Antimicrobial activity

In literature, it is maintained that ligands and their metal complexes are considerably active against Baccilusmegaterium and Candidetropicals, but that the effect of metal complexes is stronger than that of lgands.It was also reported that ligands and their metal complexes are active against Fuherica Coli, Barilumsp and Pseudomananacurtuginan, while that Cu are more effective.Morever, Cu complexes of ligands were reported to be inhibiting active against bacteria and fungi.It was also determined that ligands could produce an inhibiting effect on the development of Aspergillusniger, Penisilumrubium and Augergillusferreus.Furthermore,

it was also established that ligands had an actibacterial effect at 100ppm concentration and they had and antifungisid effect.

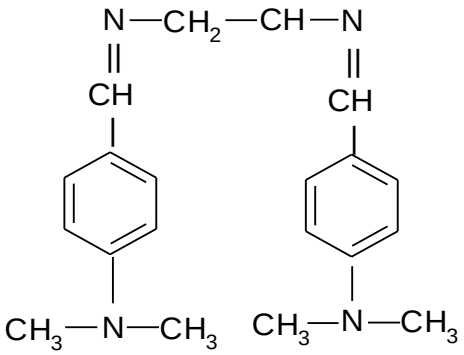
Table I: (I-III) Researching of functionalproperties of compounds.

№	Ligand and complexes	Concentration%	Bactericidial	Fungicidial
1	Ligand	1,0 0,5 0,25	3,0-3,0 2,5-2,5 2,3-2,3	3,3-3,3 2,4-2,4 2,2-2,2
2	Complex of Cu	1,0 0,5 0,25	3,2-3,2 2,6-2,6 2,5-2,5	3,2-3,2 2,2-2,2 2,0-2,0
3	Complex of Ni	1,0 0,5 0,25	3,3-3,3 2,6-2,6 2,4-2,4	3,0-3,0 2,3-2,2 2,1-2,1
4	Complex of Fe	1.0 0.5 0.25	3.4-3.4 2.7-2.7 2.6-2.6	3.4-3.4 2.8-2.7 2.5-2.5

The composition of Metal working Fluids

MWF İAC-119; İ-12 +3 % C – 75 +2% sampl.1 + 2 % İAC-14A
MWF İAC-120; İ-12 +3 % C – 75 +2% sampl.2 + 2 % sampl.3.
MWF İAC-121; İ-12 +3 % C – 75 +2% DP - 11 + 2 % sampl.3
MWF İAC-121; İ-12 +3 % C – 75 +2% DP - 11 + 2 % sampl.4

Sampl.1



Sampl.2
Cu-[bis(p-dimetyl-aminobenzylidenaminoprophan)]
Sampl.3
Ni-[bis(-p-dimetyl-aminobenzyliden-aminoprophan)]
Sampl.4
Ni-[bis(-p-dimetyl-aminobenzyliden-aminoprophan)]

In order to determine the effectiveness of the functional activities evaluated coolant lubricants Four-ball friction machine and corrosiveness to install the DC-2. The table shows the physical and chemical characteristics of the index are badass critical loads and loads commonly used welding cutting fluid MR-1 and MR-7. Characterizing the influence of the composition of additives for lubricants and anti-corrosion properties of the base oil.

The most important prerequisite for effective use of cutting fluids is stability them to microorganisms. Issues related to microbiological defeat various kinds of petroleum products, with storage in tanks and operation widely covered in the various literature, however, in practice, operators of fuel storage systems rarely identify the problem and even fewer correctament solve it. This is due to the fact that in most cases, this problem can not be detected, and moreover, the indirect effects of microbial infection are often more severe than straight. Uncontrolled microbial damage has a negative impact on the economic aspect of the production, storage, transport and consumption of lubricants and coolants, as it leads to an increase in overall costs. In order to suppress or inhibition of growth and expansion of microorganisms in liquids used biocidal additive. With the right to demonstrate how these drugs prerotated biodegradation coolant for a long time to stabilize their physico-chemical and hygienic properties. For the experiments designed to study the biological stability of the compositions of cutting fluids contact hydrocarbon-oxidizing bacteria isolated from the waste coolant. The efficiency of the antimicrobial action of the compounds developed as part of an oil coolant Institute of Additive

Chemistry (0.25-0.5%), which was evaluated by the value of the diameter of the inhibition zones of bacteria and fungi around the wells with an additive and without it the bigger it is, the more effective antimicrobial action. The samples were not affected by micro-organisms are considered susceptible to microbiological little damage. As a biocide used in the experiment benzoilasetiliniden-3-aminopropanol.

Table II: The study investigated the duration of antimicrobial activity of a biocide

Number of Weeks ı	Concentration %	Inhibitionzone diametr, sm	
		Bacteria(MPA)	Fungi (SA)
1	1,0	3,0-3,2	4,2-4,5
	0,5	2,8-2,6	4,2-4,4
2	1,0	2,7-2,9	3,6-3,8
	0,5	2,6-2,6	3,4-3,4
3	1,0	2,6-2,8	3,5-3,5
	0,5	2,4-2,4	3,2-3,2
4	1,0	2,4-2,6	3,0-3,2
	0,5	2,2-2,2	2,8-2,6
5	1,0	2,2-2,2	2,7-3,0
	0,5	1,9-2,0	2,4-2,4
6	1,0	2,0-2,1	2,3-2,5
	0,5	1,8-1,8	2,0-2,2
7	1,0	1,9-2,0	2,0-2,2
	0,5	1,6-1,7	1,8-1,8
8	1,0	2,0-2,0	1,6-1,6

From the table 2 seems an experiment to study the duration of action of antimicrobial agents in the oil cutting fluids showed high antimicrobial efficancy of the test biocide.

When determining the duration of the antimicrobial effect of the test compounds belonging to various classes of chemical compounds in experimental conditions behave differently; Some exhibit antimicrobial properties for a long time, others slowly inactivated, third-lose their antimicrobial activity immediately after their introduction into the cutting fluid.

The table 3 shows that the presence of the selected biocide's of Cu-[bis(p-dimetyl-aminobenzylidenaminoprophan)]a part of an oil based metal working fluids IAC-119 behaives enough biostability for 7 weeks.

As when testing the antimicrobial activity of the bactericides recommended counting microorganisms in our continued research studied the dynamics of growth in the number of microorganisms in the coolant within 8 weeks (table №3 **).**

Table III. The dynamics of the growth of microorganisms in the coolant

Thenumber of weeks	Theamount of hydrocarbon-oxidizingbacteria	Number of fungi
1	$81\ 10^4$	$58\ 10^4$
2	$97\ 10^4$	$59\ 10^4$
3	$103\ 10^4$	$60\ 10^4$
4	$11\ 10^4$	$61\ 10^4$
5	$12\ 10^4$	$62\ 10^4$
6	$13\ 10^4$	$63\ 10^4$
7	$23\ 10^4$	$63\ 10^4$
8	$15\ 10^4$	$72\ 10^4$

The absence of biological stability was considered in cases where the number of bacteria in the samples metal working fluids exceeded.

IV. Conclusion.

From the result of antimicrobial effect we can conclude that all compounds exhibited strong to moderate activity. Metal complexes have been found to be more effective then their ligands as the process of complexation dominantly affects the overall biological behavior of. The compound also the zone of inhibition increases with the concentration.The result suggest to chemical entities with potential for industrial use.

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