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Synthesis and Application of 2-Hidroxy Naftaldehyde Substituted Metal Complexes

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ABSTRACT: The synthesis of complexes of Cu (II) and Ni (II) with 2-hidroxy naftylden 3-amino-prophanol obtained by condensation of 2-hidroxy naftaldehyde and 3-aminoprophanol has been realized. All obtained compounds were characterized by their spectra (IR, NMR). Antimicrobial properties of initial azomethine and its complexes with Cu and Ni were investigated. It was established that they showed high bactericidal and fungicidal activity in very low concentration..

KEYWORDS: Schiff bases, metal complexes, antibacterial, antifungal properties

I. INTRODUCTION

Schiff Bases are condensation of primary amines with carbonyl compounds. The common structural feature of these ompounds is the azomethine group with a general formula RHC=N-R1, where R and R1 are alkyl, aryl, cyclo alkyl or heterocyclic groups which may be variously substituted. These compounds are also knows as anils, imines or azomethines [1].

The spectra behavior of Schiff bases has been investigated for structure explanation. Benzyilidimines show important photochromism where light absorption causes interconversion between enol-iminandketo-amine tautomers through intramolecular hydrogen transfer. They also exhibit a variety of biological activities.This has led to concentrate deep research on this [2].

Amino acid-based Schiff bases a very effective metal chelators and their metal complexes are models for a number of important biological systems. They are key intermediates in a diversity of metabolic reactions containing amino acids such as decarboxylation, recemization, transamination, and C-C bond cleave age , which are catalyzed by enzymes [3].

One of the main methods of making metal parts is machining. The most important element of the process of metal cutting is using cutting fluids (CF). As CF for metal cutting there are proposed various compositions of organic and inorganic compounds, most of which are oil-based liquids (CFs). Oil-based CFs meet a series of requirements: in particular, they must not cause a pronounced biological effect on the skin and respiratory system of employee, must have a minimalirritating effect when exposing to the nucous membranes, have low oil mist, not contain 3,4-benzpyrene and certain other hazardous substances. It is important to know the molecular composition of the oil-based CF to identify individual compounds of potential environmental pollutants. Such data are needed to create industrial environmental conditions in the workplace. Currently, CF, along with high efficiency, must meet stringent environmental requirements. In this connection conducting research on the creation of clean and safe CF is of great importance. The concept of ecologicaly friendly CFs includes technological means, the composition of which does not contain compounds that have a negative impact on the environment and the health of staff. To solve this problem, it is suggested to replace the environmental harmful components with harmless ones. It should be noted that despite the availability of a wide range of different CFs, some of the commodity produced liquids are ineffective, often do not meet the requirements imposed on them, multi-component, stable enough to contain combinations of additives for various applications. To obtain certain high-performance CF it is important to use the original components of quality have scientifically grounded composition and production technology.Taking into account the above mentioned, our research is oriented to improving cost-effective, low-component and environmentally friendly compositions [4]. Compositions were developed considering the analysis of the available literature data on the CF compositions and components of the functional purpose.

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II. EXPERIMENTAL PART

IR spectra were investigated by use of UR-20 spectrometer at the 400-4000 sm^{-1} zone, NMR spectra by use of Bruker-spectrometer in the solvent of C_2D_2OD.

2.1 2-hidroxy-naftylden-3-aminoprophanol (I).

The ligand was synthesized by the condensation of p-dimetylaminobenzaldehyde with α-naftylamine in 1:1 molar ratio using absolute alcohol as the reaction medium. The mixture was refluxed on a water bath for 1 and half an hour and then allowed to stand overnight at room temperature. The product was crystallized from the same solvent.

2.2 The complex of Cu(II) (II). They were prepared by reacting ethanolic solution of the ligand with ethanolic solution of metal acetate in 1:2 molar ratio. The precipitating solid colured complexes were filtered, washed with ethanol, dried in oven.

2.3 The complexes of Ni(II) (III).They üere prepared by reacting ethanolic solution of the ligand üith ethanolic solution of metal acetate in 1:2 molar ratio. The settled down solid colured complexes were filtered, washed with ethanol, dried in oven [5].

2.4 At studying antimicrobial properties of the synthesied compounds there was used the cavity method on agar medium with using suspension of different cultures (Pseudomonas Aeruginosa, Mycobacterium lacticolium, Aspergillus niger, Cladasporium resinale, Penicillum Chrosegenum, Chastomium globodium Trichoderma viride). The strelized (autoclaved 121 ^{0} C for 15 min), medium (40-50 ^{0} C) was poured into the Petri dishes at a depth of 3-4 mm and allowed to solidfy. The plates were preincubated forth at room temperature and incubated at 37 ^{0} C for 24 hours [6].

III. RESULTS AND DISCUSSION

The perspective N-containing compounds present a wide class of organic chelate forming compounds containing hetero atoms. Such compounds are able to coordinate with metals, and complexes obtained on their basis often have an effective biological activity [7,8].

The functional properties of the compounds were studied in M-8 oil by use of the standard laboratory methods. Results of studying antimicrobial properties of synthesized compounds are indicated in the table As follows from the table in condition of friction regime synthesized Schiff base and its complexes at 1 % concentration have high antimicrobial properties (0,47-0,40 mm) and improve lubricating properties of the oil. Studied additives are better than the wellknown additive (tricresilphosphate).

Antimicrobial efficency of studied cvompounds in M-8 oil was evaluated by diameters of the degradation zone around the cavity both with additive and without it: increasing diameters leads to improving antimicrobial efficency. M-8 oil itself doesnt have biostability. Results of the study are indicated in the table. As follows from the table synthesized azomethine and its metal complexes have antimicrobial properties. They overbalance known additive-sodium pentachlorophenolate (etalon) by efficency (at the same concentration).

The antimicrobial properties of synthesized compounds were investigated. It was determined that compounds show high antimicrobial properties in very low concentrations. It was also proved that metal complexes show more effective antimicrobial properties than ligand. It means that inititating of meta to lligand structure change the properties. If we compare nikkel and copper complexes copper complexes show antimicrobial properties in very low concentration more effective than nikkkel complexes.

Studying functional properties of synthesized compounds

Ligand and complexes	Concentration %	Mixed Bacteria (MPA)	Mixed Bacteria (SA)	Antiwear property of M-8 oil, mm
2-hidroxynaftylden-3amino-prophanol	1.0 0.5 0.25 0.1	3.0-3.1 2.6-2.6 2.4-2.4 2.2-2.2	3.0-3.0 2.5-2.5 2.2-2.2 2.0-2.0	0.47
L_2CuX_2	1.0 0.5 0.25 0.1	3.3-3.3 2.6-2.6 2.5-2.5 2.4-2.4	3.3-3.3 2.8-2.8 2.6-2.6 2,5-2.5	0.4
L_2NiX_2	1.0 0.5 0.25	3.3-3.3 2.7-2.7 2.4-2.4	3.3-3.3 2.8-2.7 2.6-2.6	0.45

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	0.1	2.3-2.3	2.4-2.4	
Sodium pentachloro-phenolate	1.0 0.5	1.3 0.7	1.4 0.7	
Tricresilphosphate	1.0			0.65
M-8 oil	-	++	++	

IV. CONCLUSION

Thus, synthesized compounds are of certain interest as multifunctional additives to lubricating oils improving their antimicrobial and antiwear properties. Use of them in the CF composition will allow to reduce amount of the components at keeping their exploitation properties.

Synthesized compounds with antimicrobial properties were studied in the composition of additives to CFs. In compositions there were used the known industrial additives (2-75-detergent, Df—multifunctional additive). These compounds show high antimicrobial properties in very low amount, therefore they can be use as additives.

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