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Synthesis of Corrosion Inhibitors Based on ((1,2-Diphenylhydrazinyl)(3-Nitrophenyl))Methyl Phosphine Acid and its Properties

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Abstract: this paper presents the synthesis and identification of ((1,2-diphenylhydrazinyl)(3-nitrophenyl))methyl phosphinic acid (DFGNFMFK) and the corrosion rate and protection levels of DIIMFK inhibitor in Fon-1 Fon-2 and Fon-3 working solutions at different temperatures and concentrations .

Key words: inhibitor, corrosion rate, plate, concentration, medium, degree of protection, IR spectrum, ((1,2-diphenylhydrazinyl)(3-nitrophenyl))methyl phosphinic acid, temp.

The process of corrosion is a process of chemical and electrochemical as well as biological degradation of metals as a result of environmental effects. According to the mechanism of the process, there are chemical, electrochemical and biochemical corrosion. Corrosion begins at the surface of the metal and spreads deeper with further development of the process. The environment in which metal corrosion occurs is various liquids and gases.

The corrosion process occurs at the boundary of two phases: metal-environment, that is, it is a heterogeneous process of interaction of a liquid or gaseous environment with a metal. Alloys of iron, copper, aluminum, nickel, titanium and others are widely used in the chemical industry. Further development of technology increases the problem of using such metals [1-5].

Active substances present around the structural part of the metal, affecting its material and causing corrosion, are called corrosive environment. Corrosive environment can be atmospheric air, industrial atmosphere, gases, water, marine atmosphere, earth, acids, alkalis, water and salt solutions. When materials are cleaned in factories and enterprises, when they are thoroughly treated with acids and washed, aggressive environments are formed that lead to steel corrosion, consisting of a mixture of various acids and salts.

Synthesis of highly effective inhibitors based on ((1,2-diphenylhydrazinyl)(3-nitrophenyl))methyl phosphinic acid is of great importance to protect metals from corrosion.

It has been determined that ((1,2-diphenylhydrazinyl)(3-nitrophenyl))methyl phosphinic acid (DFGNFMFK) has been formed as a result of the three-component condensation of benzidine (1,2-diphenylhydrazone), m-nitrobenzaldehyde and hypophosphitic acid. Benzidine, m-nitrobenzaldehyde and hypophosphite were mixed in a 1:1:10 mole ratio in the flask. It has been heated at 500C for 3 hours. Then the reaction mixture has been cooled and filtered. The yield of obtained ((1,2-diphenylhydrazinyl)(3-nitrophenyl))methyl phosphinic acid is 78%.

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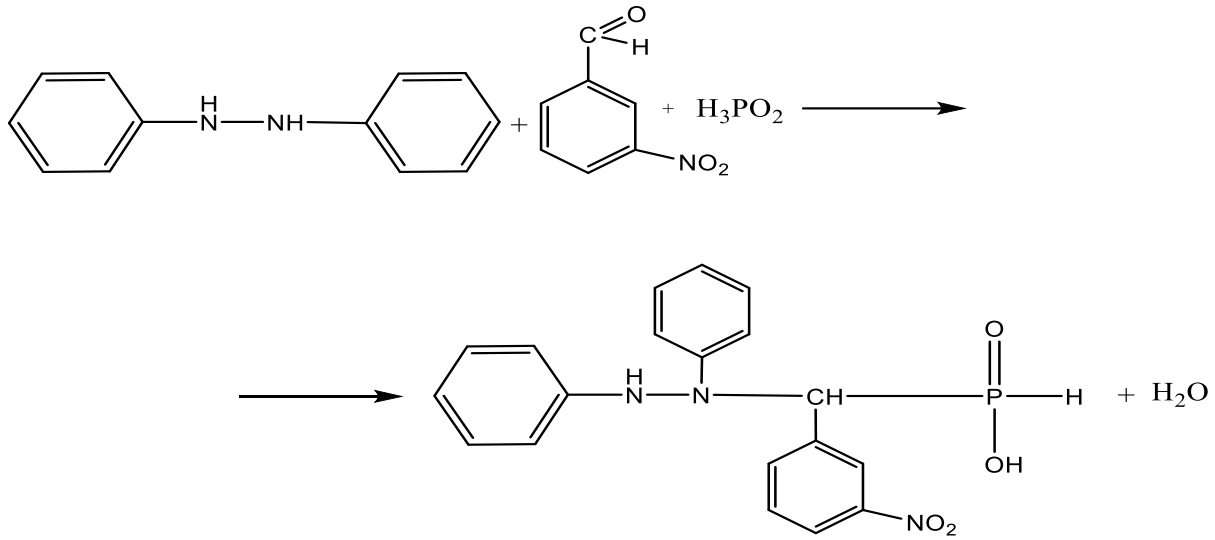

Scheme 3. Three-component condensation of 1,2-diphenylhydrazone, m-nitrobenzaldehyde and hypophosphite

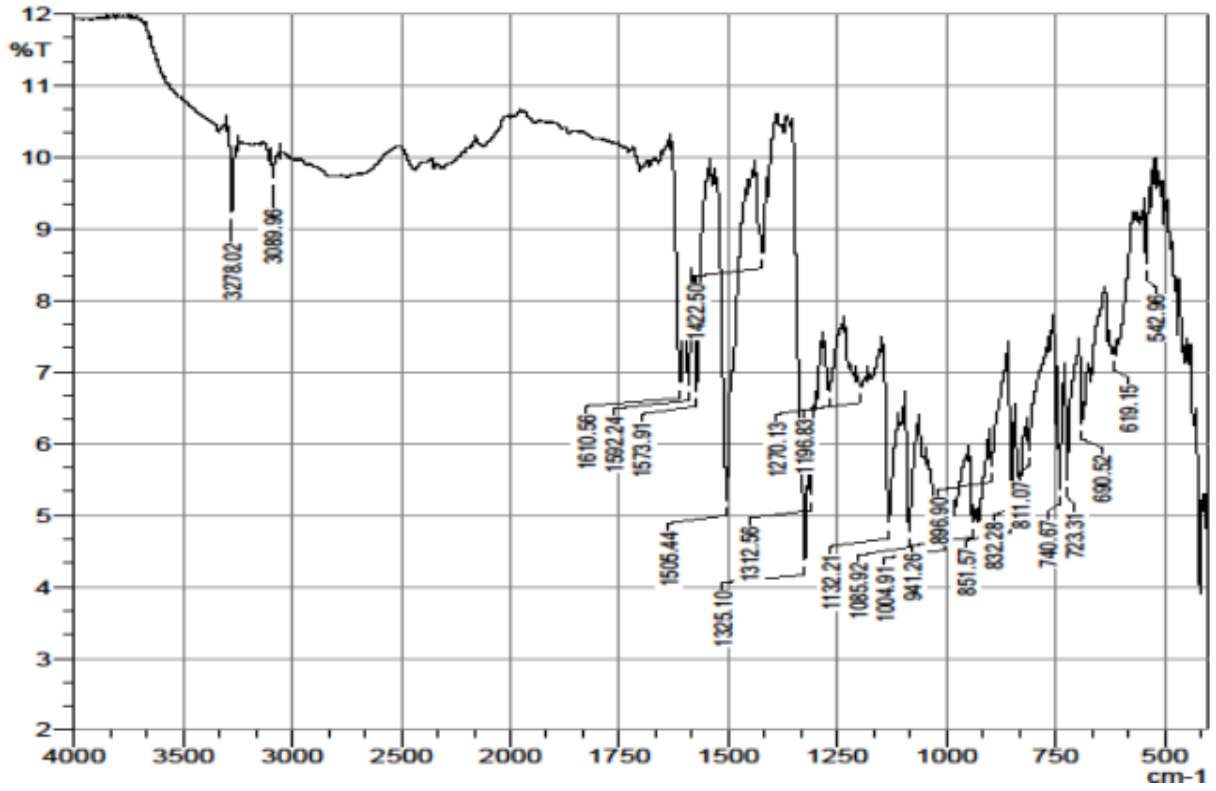

Figure 3. IR spectrum of ((1,2-diphenylhydrazinyl)(3-nitrophenyl))methyl phosphinic acid.

According to the IR spectrum results of (DFGNFMFK), groups corresponding to absorption maxima in the following range are listed: 2931-2819 cm^{-1} ν (OH), 1458 cm^{-1} ν (-O-CH-), ν (-N-CH-), 1340 cm^{-1} ν(P=O), 1111 cm^{-1}, 1037 cm^{-1} ν (P-C-N). According to the analysis of the IR spectrum of DFGNFMFK, in the 2931-2819 cm^{-1} regions, vibration lines of ν (OH) bound hydroxyl group appeared, ν to (-N-CH-) groups, 1340 cm^{-1} ν (P= Absorption maxima corresponding to the phosphorus oxygen bond were formed in the O) region, and to the ν (P-C-N) group in the 1037 cm^{-1} region.

In order to study the level of effectiveness of the synthesized inhibitors, highly aggressive working solutions, which are widely used in industrial enterprises and create an active corrosive environment, have

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been used. Considering the high aggressiveness of the working solutions prepared for conducting experiments, their role in industrial enterprises is very important, because as a result of deep work and processing with a large amount of acidic environments, an excessive amount of hydrochloric acid (often hydrochloric acid is used, in rare cases sulfuric or phosphoric acids are added is used) and chlorides from salts (mostly NaCl) are found in the remaining environment in the form of residues. These residual salts increase the risk of corrosion of steel structures and materials[6-10].

We tentatively called working solutions background solutions.

A strongly acidic saline solution consisting of 1M HCl + 200 mg/l NaCl (background-1) has been used as background 1 working solution.

A solution consisting of 0.5 HCl + 200 mg/l NaCl (background-2) has been used as background 2 working solution.

3- a solution consisting of 0.5 M H_2SO_4 + 200 mg/l NaCl (background-3) has been used as background working solution. Also, solutions consisting of 0.5 M H_2SO_4, 0.5 HCl, 1 M H_2SO_4 and 1% NaCl have been used for experiments.

Technical water is used in most production and processing shops of enterprises. By changing the composition of technical water, corrosive aggressive environments are created. Inhibitors have been also tested in technical water itself. Working background media have been prepared by adding specified amounts of hydrochloric acid, sulfuric acid and sodium chloride salts to drinking water. By means of these, environments created in production plants have been created. The test procedures have been carried out in the scientific research laboratory of the Department of General and Inorganic Chemistry of Bukhara State University, and the synthesized inhibitors were tested in working solutions of background-1, background-2 and background-3.

Table 1

Efficacy of DFGNFMFK inhibitor in different amounts of 10% HCl and 5% H_2SO_4 solutions at room temperature

Inhibitor	Inhibitor amount mg/l	Time, s	10% HCl		5 % H_2SO_4	
			W, gr/(cm^2·hour)	Z%	W, gr/(cm^2·hour)	Z%
DFGNFMFK	**100**	**12**	0,0470	86,53	0,0645	81,51
		24	0,0297	87,89	0,0431	82,43
		36	0,0303	89,46	0,0418	85,47
	200	**12**	0,0425	87,81	0,0582	83,31
		24	0,0241	90,17	0,0355	85,53
		36	0,0195	93,22	0,0341	85,53
	300	**12**	0,0375	88,81	0,0521	84,31
		24	0,0191	91,15	0,0274	88,53
		36	0,0145	94,23	0,0270	89,41

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The corrosion rate and protection efficiency of the synthesized inhibitor investigated in the above aggressive environments at concentrations ranging from 100 mg/L to 300 mg/L, and the results are shown in Table 1. The results are as follows: the value of 100 mg/l DFGMFMFK inhibitor in 10% hydrochloric acid, i.e. the corrosion rate for 12 hours was 0.0470, the protection level was 86.53%. The values in 5% sulfuric acid medium have been found to be 0.0045 and 81.51%, respectively.

Based on the obtained results, it can be concluded as follows, DFGNFMFK inhibitors and their anti-corrosion properties, the influence of inhibitor concentrations, environmental temperature and environmental aggressiveness levels on the protective efficiency of inhibitors have been determined. The range of optimal concentrations and temperatures for the use of inhibitors has been determined.

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