

Opportunities for Getting Rust Modifications on the Base of Local Resources for Corrosive Surface

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Abstract: In this article, 22% of the phosphoric acid content is derived from surfactants, corrosion inhibitors and industrial waste densities that have an artificial resource and study advanced rust modifiers. Adding exterior-active substances, corrosion inhibitors and technogen resources to 22% phosphate acid. In order to create optimal composition of multi-functional rust modifications and analyzing available products with chemical and physical methods. Modern physical-chemical methods, X-ray phased, IR- spectroscopic research are used. Melting diagram of 22% H_3PO_4 – $(\text{CH}_2)_6\text{N}_4$ – $\text{C}_5\text{H}_6\text{O}_2$ triple polythermal system has been investigated for the first time and modifier with new composition has been synthesized. As a result of total scientific research, the new technology of getting chemical refining modifiers from competitive multi-functional rust has been founded. Taking everything into account, results, taken on the base of studying melting level in $[\text{22\% H}_3\text{PO}_4 + 78\% \text{H}_2\text{O}] - (\text{CH}_2)_6\text{N}_4 - \text{C}_5\text{H}_6\text{O}_2$ system, lead to the creation of new technology of getting new rust modifiers on the base of extractive phosphate acid, furfural alcohol and hexamethylenetetramine.

Keywords: Phosphate Acid, Hexamethylenetetramine, Lignin, Modifier, Inhibitor, Solubility of Polytreme IR-Spectroscopy, Differential Thermo Analysis, Furfural

1. Introduction

According to the analysis of scientific research all over the world till now, there is very few amount of scientific information on the solution of issues, including, refining corrosive remains, old paints and oil substances on the surface of metals. Available ones are for the purpose of mechanic refining of surfaces, and based on hard work and large quantity of energy. This type of refining cannot be used in high buildings and main pipes situated on desert zones. In addition to this, it may cause to the collapse of metal base [1-4].

According to the above mentioned reasons, today's one of the most significant issues is creating modern and competitive types of effective refining products on the base of local resources for corrosive surfaces. In its turn, this leads to the decrease in the import of this product to the country and this scientific work is included as a scientific research to the development of national economy. Rust modifications,

energy saver, substituted for import and aimed at export, and recycled from industry waste products and local resources, will be applied for being produced on the base of high technology [4-5].

It is well known that, corrosive products, instead of iron oxide, form as phosphorous compounds or as a phosphate crusts on the surfaces when the passivation of oxidized parts of metal products with the solution of phosphate acid. These crusts are connected chemically with metal bases; consist of the small microscopic-sized crystals that grow jointly. In order to form phosphate crusts in the solution, there should be optimal concentration of phosphate acid. High level of phosphate acid may lead to melting process of metal and burn of rust and iron. As a result of easy oxidation of Iron (II) phosphate, phosphate crusts are not be able to do the function of protection, it means that when the phosphate concentration is low, it cannot modify the rusts on the surface of the metal completely.

2. Methods

In order to avoid available corrosive products, it is recommended to add out-active substances, acid-corrosive inhibitors and other compounds to the corrosion competitive layer on the base of extractive phosphate acid. Hexamethylenetetramine, furfural alcohol, hydrolysis lignin are the substances that include these characteristics in themselves. However, when clarifying the technology of effective rust modifications, include above-mentioned substances, physically and chemically, it is required to have the values of extractive phosphate acid with their components melting politrems [6-7].

Aim: Adding exterior-active substances, corrosion inhibitors and technogen resources to 22% phosphate acid In order to create optimal composition of multi-functional rust modifications and analyzing available products with chemical and physical methods.

Methods of research: Modern physical-chemical methods, X-ray phased, IR- spectroscopic research are used.

Scientific novelties: Melting diagram of 22% H_3PO_4 – $(\text{CH}_2)_6\text{N}_4$ – $\text{C}_5\text{H}_6\text{O}_2$ triple polythermal system has been investigated for the first time and modifier with new composition has been synthesized. As a result of total scientific research, the new technology of getting chemical

refining modifiers from competitive multi-functional rust has been founded.

Gathered Information: When solubility of polytrene has been studied, this type of new compositions occurs: $(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot 4\text{H}_2\text{O}$, $(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot 2\text{H}_2\text{O}$, $(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot \text{H}_2\text{O}$, $\text{H}_3\text{PO}_4 \cdot (\text{CH}_2)_6\text{N}_4$

It has been proved that these compositions are individual substances by above-mentioned methods. It leads to the synthesis of modifier with new composition.

3. Materials and Results

We began the work with studying the interaction of Hexamethylenetetramine, furfural alcohol and extractive phosphate acid in order to add exterior-active substances, corrosion inhibitors and technogen resources to 22% phosphate acid. For that reason, we studied the melting diagram of 22% H_3PO_4 – $(\text{CH}_2)_6\text{N}_4$ – $\text{C}_5\text{H}_6\text{O}_2$ triple polythermal system [7-8].

While studying the diagram, it is found out that melting level of hexamethylenetetramine with furfural alcohol decreases to 14% from 46, 6% on 22% phosphate acid. While studying this triple system, new four substances have been found and all the information about the composition of chemical compounds is given in Table 1.

Table 1. Chemical composition of new-found compositions taken from hexamethylenetetramine and furfural alcohol.

Compound	Found mass. %			Accounted. mass. %		
	H_3PO_4	$(\text{CH}_2)_6\text{N}_4$	H_2O	H_3PO_4	$(\text{CH}_2)_6\text{N}_4$	H_2O
$(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot 4\text{H}_2\text{O}$	31.56	45.22	23.22	31.61	45.16	23.23
$(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot 2\text{H}_2\text{O}$	35.80	51.05	13.15	35.77	51.09	13.14
$(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot \text{H}_2\text{O}$	23.71	67.86	8.43	23.67	67.63	8.70
$\text{H}_3\text{PO}_4 \cdot (\text{CH}_2)_6\text{N}_4$	41.23	58.77	-	41.18	58.82	-

X-ray phased analyses are done with the facility called DRON-2. Distance among phases is found out with the comparison of intensity of diffraction lines.

Radiography of synthesized compounds show that the absence of reflex related to initial substances, individuality

and purity of new compounds [9-12].

New synthesized $(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot \text{H}_2\text{O}$; $(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot 2\text{H}_2\text{O}$; $(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot 4\text{H}_2\text{O}$; $\text{H}_3\text{PO}_4 \cdot (\text{CH}_2)_6\text{N}_4$ compounds have individual crystal net. Radio graphical analysis results are given in the Table 2.

Table 2. Distance through planes and relative intensity of hexamethylenetetramine and its components on radio graph.

Compounds	d. Å	I. %	d. Å	I. %	d. Å	I. %
1	2	3	4	5	6	7
$(\text{CH}_2)_6\text{N}_4$	12.107	9.0	4.618	25.0	2.415	15.5
	8.321	17.0	4.035	70.0	2.190	100.0
	7.794	21.0	3.602	15.0	2.913	99.0
	7.117	24.0	3.199	91.5	1.756	32.0
	6.398	49.0	2.647	85.4	1.655	13.0
	5.858	69.8	2.570	11.0	1.585	40.0
	5.766	42.0	3.155	24.0	1.970	11.0
	5.752	41.5	3.106	50.0	1.885	6.5
$(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot \text{H}_2\text{O}$	5.262	38.5	2.712	30.0	1.857	6.0
	5.074	58.0	2.443	15.0	1.775	6.8
	4.706	100.0	2.402	14.0	1.734	3.5
	4.307	98.0	2.212	13.0	1.707	4.5
	3.507	36.0	2.211	18.0	1.6482	5.0
	3.366	23.0	2.023	12.5	-	-
	9.461	41.0	3.105	72.0	2.082	26.0
	8.279	30.0	2.894	24.0	2.036	11.0
$(\text{CH}_2)_6\text{N}_4 \cdot \text{H}_3\text{PO}_4 \cdot 2\text{H}_2\text{O}$	6.398	32.0	2.862	21.0	2.017	14.0
	5.578	46.0	2.775	76.5	1.990	13.5
	5.262	85.0	2.590	32.5	1.941	9.5

Compounds	d. Å	I. %	d. Å	I. %	d. Å	I. %
1	2	3	4	5	6	7
(CH ₂) ₆ N ₄ •H ₃ PO ₄ • 4H ₂ O	5.140	53.0	2.525	13.0	1.832	9.0
	4.947	98.0	2.450	15.0	1.717	15.5
	4.468	100.0	2.405	27.0	1.707	6.0
	3.759	31.5	2.280	16.0	1.617	5.0
	3.469	20.0	2.180	18.5	1.593	5.5
	3.255	92.0	2.170	33.5	-	-
	9.453	40.0	3.308	74.0	2.044	24.0
	7.779	28.0	2.534	25.0	2.016	10.0
	5.344	30.0	2.462	20.0	1.917	12.0
	5.235	42.0	2.332	66.5	1.618	11.5
	5.162	81.0	2.320	31.5	1.391	8.5
	5.270	51.0	2.221	12.0	1.732	8.0
	4.631	95.0	2.110	14.0	1.511	14.5
	4.421	99.0	2.305	26.0	1.302	5.0
	3.568	30.2	2.310	15.0	1.419	4.0
	3.571	24.0	2.380	17.5	1.693	4.5
	3.324	94.0	2.370	32.5	-	-

Hexamethylenetetramine and its new compounds with extractive phosphate acid are studied with IK- spectroscopic method. Analysis results are given in 3rd Table. IK- specters

of compounds on the basis of hexamethylenetetramine and phosphate acid differ completely from the specter of hexamethylenetetramine (Table 3).

Table 3. IK- spectroscopic results of hexamethylenetetramine and its new compounds with extractive phosphate acid.

Proper functional groups	Compounds			
	(CH ₂) ₆ N ₄	(CH ₂) ₆ N ₄ H ₃ PO ₄ •H ₂ O	(CH ₂) ₆ N ₄ H ₃ PO ₄ •2H ₂ O	(CH ₂) ₆ N ₄ H ₃ PO ₄ •4H ₂ O
H(OH)	-	3380. 3320	3350. 3170	3390. 3370
H(CH ₂)	2880. 2956	2800. 2760	2820. 2730	2930. 2730
H(H ₂ O)	-	1600	1600	1600
H(CH ₂)	1438. 1450	1450. 1400	1470	1470
H(CN)	1370	-	-	-
H(CN)	1240	1240. 1270	1200. 1160	1220. 1260
H(CN). v(PO ₄ ⁻³)	1050	1060	1050	1060
H(CN)	1010	990	1000	1020
H(CN)	812	840	850. 700	870. 750
H(CN)	674. 513	650	670	680

In the high-frequency region 3380, 3320 sm⁻¹ There are signs of absorption of stretching vibrations of water molecules around them. It should be emphasized that in the region of 3070-3160 sm⁻¹ and 2350-2815 sm⁻¹, many traces of absorption. It is related with the inner molecular interactions and through molecules. Take for instance, oxygen atom of phosphate acid remain and hydrogen atom of methyl group of hexamethylenetetramine remains participate in forming hydrogen bond. This kind of traces of absorption can be seen in lots of compounds like that. The tracks observed at 1025-1040 and 980 sm⁻¹ correspond to the stretching vibrations of the RO₄⁻³ group. According to the information on the base of the analysis of IR-specter, the protonation of hexamethylenetetramine base, nitrogen atom on the account of acid protons. New compounds will be generated as an interaction of acid-base [13-17].

Taking everything into account, results, taken on the base of studying melting level in [22% H₃PO₄ +78% H₂O] – (CH₂)₆N₄–C₅H₆O₂ system, lead to the creation of new technology of getting new rust modifiers on the base of extractive phosphate acid, furfural alcohol and hexamethylenetetramine.

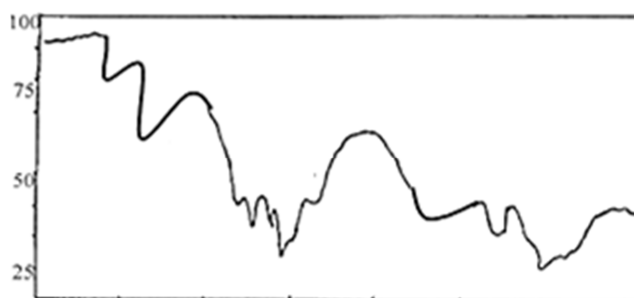


Figure 1. New compounds (CH₂)₆N₄ IR-specters.

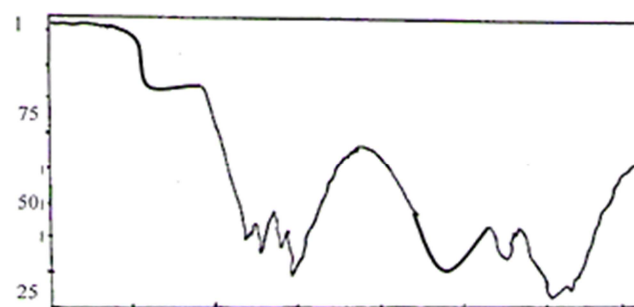


Figure 2. New compounds (CH₂)₆N₄•H₃PO₄•H₂O IR-specters.

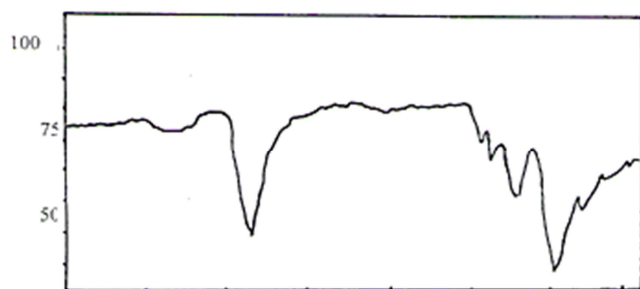


Figure 3. New compounds $(\text{CH}_2)_6\text{N}_4\text{H}_3\text{PO}_4 \cdot 2\text{H}_2\text{O}$ IR-specters.

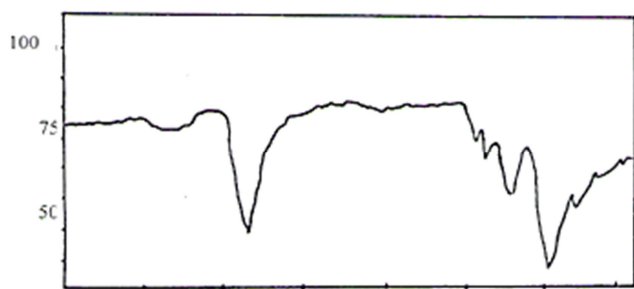


Figure 4. New compounds $(\text{CH}_2)_6\text{N}_4\text{H}_3\text{PO}_4 \cdot 4\text{H}_2\text{O}$ IR-specters.

4. Conclusion

All the above-mentioned information serve to the base of creating new technology of getting new rust modifiers on the base of extractive phosphate acid, furfural alcohol and hexamethylenetetramine. These compositions without passivating the metal surfaces, give an opportunity of modifying the rust, phosphatizing, providing with the inhibitors that helps to prevent of being rust. In its turns, this leads to make the process easier, saving the composition and having strong protection layer on the surface.

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