

THE RESEARCH OF THE AMIDOAMINES IN COMPOSITIONS WITH VARIOUS CONTENTS AS INHIBITORS

Yegana Jamal Aghazada

PhD, Senior Scientific Researcher at Yu.G.Mamedaliyev Institute of Petrochemical Processes, Baku, Azerbaijan

Abstract - In this proceeding, the compositions of the T-30 turbine oil with liquid rubber, the complex of polyethylene polyamine with natural petroleum acid (NPA) and nitrocompounds which are synthesized on the basis of $C_{14}H_{28}$ α -olefins have been investigated in different ratio and contents as conservative liquids. The experiments have been operated with 10% concentration of the inhibitor on the steel plates in condensation and environment phases in the experiment chamber called "corrosionbox". It has been revealed that the conservative liquid that is produced by the composition of the synthesized inhibitor and nitro compound in the presence of liquid rubber has a great protection against corrosion than their individual usages, meets the requirements and has a great practical importance.

Key Words: conservative liquids, corrosion, inhibitor, natural petroleum acids (NPA), polyethylene polyamine (PEPA), amidoamine, liquid rubber, nitro compound

1.INTRODUCTION

Nowadays, because of the aggressive influence of the environment, a number of metal equipments undergo corrosion in the different areas of the industry and engineering as well as the oil and gas industry, as a result, a huge amount of the governmental funds are wasted. The application of the conservative liquids for setting up the protection system of the complex technological gadgets based on the metal constructions is considered as an effective method. The widespread investigation of the inhibitors in the conservative liquids is based on its economic efficiency and simple structure of application technology [1]. According to the opinions of the majority of the corrosion specialists, the most economically efficient method is the application of the inhibitors among the protection methods against this problem. So, the addition of a small amount of an inhibiting substance to the aggressive

system is enough for protecting the metal without any changes to the current technical system.

The majority of the inhibitors those are used in order to protect the metal-based technological appliances of oil-gas extraction and refinery industries from corrosion are complex compounds which contain nitrogen. The size of the molecules of the inhibitors those are absorbed to the surface of the metals and creates a protective coating is directly related to its influence mechanism. So that, when the radical of the inhibitor increases up to a certain level, the protection effect will be higher [2]. As a result of its chemisorption ability, inhibitor in the conservative liquid decreases the dissolution by pacifying the processes on the surface, provides a protective coating by creating a complex in the sphere of influence and prevents the corrosion of metal [3]. In recent years, the application of the composition based reagents as corrosion inhibitors are actual.

2.EXPERIMENTALS

2.1.Materials and Methods

In the given proceeding, the solution of amidoamines which are prepared by the interaction of natural petroleum acids with polyethylene polyamines in T-30 oil, as well as the composition of the solution of the inhibitor which is manufactured by the complex of them with nitro compounds in T-30 oil and liquid rubber have been studied for corrosion protection purpose.

The compounds those have inhibitor properties in the prepared conservative liquids mainly consist of a number of components:

1. The composition of the solution of the amidoamines prepared by the interaction of natural petroleum acid with polyethylene polyamine in T-30 oil with liquid rubber;
2. The composition of the solution of amidoamines and aliphatic based nitro derivatives in T-30 oil with liquid rubber;
3. The composition of the solution of amidoamines and aliphatic based nitro derivatives in T-30 oil with oxidized liquid rubber.

“T-30” turbine oil has been used as a solvent.

The reagents those have been tested as inhibitors are the free amidoamines and complex of amidoamines those have been synthesized by the reaction of natural petroleum acid with polyethylene polyamine in different mole ratios with nitro compound. The nitro compound that has been used in the process was synthesized by treating $C_{14}H_{28}$ α -olefin with nitric acid in optimum conditions. A composition of the manufactured solution with the polybutadiene based liquid rubber has been tested on the steel plates. The liquid rubber which is used in the experiment has been manufactured on the basis of the stereoregular structured 1, 4 - cis - polybutadiene that has a wide application sphere in the industry.

3.RESULTS AND DISCUSSION

The efficient results of the experiments of liquid rubber have been taken into consideration and the process has been continued by using oxidized liquid rubber.

The experiment has been operated according to the current standards in the chamber called “corrosionbox”. The process has been carried out in two phases: condensation and atmospheric phase. Electronic appliances have been used in order to adjust the standard parameters for obtaining sustainable trials in the experiment chamber. For the condensation phase, these parameters are the temperature of the chamber and the duration of the trial, for the environmental phase, these are the temperature of the moisturizing agent and the chamber and the duration of the trial.

Table-1: The results of the trials of liquid rubber and synthesized compounds as conservative liquids both individually and as compositions.

№	The solutions of the compositions in the “T-30” oil			The duration of the protection from corrosion, days	
				Condensation phase	Atmospheric phase
	Content	The amount of the components (%)			
Inhibitor		Solution			
1	T-30 oil	-	-	6	15
2	Liquid rubber	-	10	14	38
3	Oxidized liquid rubber	-	10	20	75
4	Liquid rubber + Amidoamine (NPA:PEPA 1:1)	-	10	23	78
5	Liquid rubber + Amidoamine (NPA:PEPA 2:1)	5 5	10	29	89
6	Liquid rubber + Amidoamine (NPA:PEPA 3:1)	5 5	10	22	75
7	Liquid rubber + Amidoamine (NPA:PEPA 5:1)	5 5	10	24	79
8	Liquid rubber + Amidoamine (NPA:DETA 2:1)	5 5	10	21	76
9	Liquid rubber + Amidoamine (NPA:DETA 3:1)	5 5	10	19	71
10	Liquid rubber + Amidoamine (NPA:TETA 2:1)	5 5	10	23	77

11	Liquid rubber + Amidoamine (NPA:TETA 3:1)	5 5	10	22	76
12	Liquid rubber + Amidoamine (NPA:PEPA 2:1)	5 5	10	189	254
13	Nitrocompound Liquid rubber	5 5	10	65	125
14	Liquid rubber + Amidoamine (NPA:PEPA 2:1) + Nitro compound	3.33 3.33 3.33	10	318	415
15	Liquid rubber + Amidoamine (NPA:PEPA 3:1) + Nitro compound	3.33 3.33 3.33	10	271	344
16	Liquid rubber + Amidoamine (NPA:PEPA 5:1) + Nitro compound	3.33 3.33 3.33	10	287	361
17	Liquid rubber + Amidoamine (NPA:TETA 2:1) + Nitro compound	3.33 3.33 3.33	10	280	352
18	Liquid rubber + Amidoamine (NPA:TETA 3:1) + Nitro compound	3.33 3.33 3.33	10	254	341
19	Liquid rubber + Amidoamine (NPA:DETA 2:1) + Nitro compound	3.33 3.33 3.33	10	279	345
20	Liquid rubber + Amidoamine (NPA:TETA 3:1) + Nitro compound	3.33 3.33 3.33	10	249	302
21	Oxidized liquid rubber + Amidoamine(NPA:PEPA 2:1) + Nitro compound	3.33 3.33 3.33	10	334	447
22	Oxidized liquid rubber + Amidoamine(NPA:PEPA 3:1) + Nitro compound	3.33 3.33 3.33	10	292	365
23	Oxidized liquid rubber + Amidoamine(NPA:TETA 2:1) + Nitro compound	3.33 3.33 3.33	10	297	378
24	Oxidized liquid rubber + Amidoamine(NPA:TETA 3:1) + Nitro compound	3.33 3.33 3.33	10	274	351
25	Oxidized liquid rubber + Amidoamine(NPA:DETA 2:1) + Nitro compound	3.33 3.33 3.33	10	298	381
26	Oxidized liquid rubber + Amidoamine(NPA:DETA 3:1) + Nitro compound	3.33 3.33 3.33	10	256	322

Note:

1. NPA – the fraction of natural petroleum acid with a boiling range between 200-300°C, PEPA – polyethylene polyamine, DETA – diethylene triamine, TETA – triethylene triamine
2. 1:1, 2:1 and etc. ratios display the mole ratios of NPA to PEPA in amidoamine synthesis

As it is obvious from the table, metal sheets were protected 15 and 38 days by using T-30 turbine oil and liquid rubber respectively, however these pointers were higher when inhibitor was used. When 10 % concentration of the inhibitor (Liquid rubber + Amidoamine (NPA+PEPA 2:1) + Nitro compound) was used, in the condensation phase, the protection of the metal sheets from the corrosion lasted 318 days, however, in environmental phase, it was 415 days. The comparative analysis of the results has been operated in order to identify the influence of the liquid rubber on the composition content. Without liquid rubber, the content that is mentioned above (Amidoamine (NPA:PEPA 2:1) + Nitro compound) protected the material from corrosion for 189 and 254 days in the appropriate phases. As can be seen, it is very low in comparison to the initial results (318 and 415 days). At the same time, the corrosion protection efficiency of the conservative liquids those have been produced on the basis of the oxidized liquid rubber was high. As a result of the experiments, it has been revealed that these complexes perfectly chemisorb on the metal surface and produce strong coating for protection from corrosion.

The physical and chemical properties of the synthesized amidoamines carrying free amine groups have been tested for research purposes and it has been identified that, the efficiency of the inhibitor depends on the molecular mass of the polyamine. The experiments depict that, the efficiency of the inhibitor increases when diethylenetriamine, triethylenetetraamine and other polyethylene polyamines those have greater molecular mass are used.

As can be seen from the table which indicates the results of the experiments, the manufactured conservative liquids may be used in order to protect the metals from corrosion for industrial and agricultural purposes. The components those have been used for producing conservative liquids are cost effective and environmentally – friendly, on the other hand, they have simple manufacturing technology and rich feedstock. Both T-30 oil which is used as medium and additives and liquid rubber which have inhibiting property are produced on the basis of local raw material which has enough reservoir.

4. CONCLUSIONS

So, the comparative analysis of the results reveals that the usage of compositions of the synthesized amidoamines

with nitro compounds in the presence of the oxidized liquid rubber as inhibitors has a practical importance for producing more effective conservation liquids.

REFERENCES

- [1]. Y.J.Aghazada " The research of the compositions those are prepared on the basis of the petroleum products as conservative liquids." Journal: Journal of Advances in Chemistry Vol. 12, No. 123 November, 2015 p.3940-3943
- [2]. Вигдорович В.И., Шель Н.В.// Защита металлов, 2005.Т.41. №4,page.427-734.
- [3]. Verfahrenzum Schutz von Rohrleitungen, Halbzeugen und Fertigkomponenten. Способ защиты трубопроводов, полуфабрикатов и готовых изделий. Stahl und Eisen 2012. 132, №8, page .56.Nem.

BIOGRAPHY



PhD Yegana Jamal Aghazada is working as a leading scientific researcher at Yu.G.Mamedaliyev Institute of Petrochemical Processes. Her main scientific objective is the protection of metals from corrosion.