



Application of nitrogen-storing compounds based on synthetic oil and individual carbon acids as corrosion inhibitors

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Abstract

The field of application of corrosion inhibitors in the oil industry is very extensive. In special cases, they are used in the oil and gas industry to protect equipment used during oil and gas extraction, processing and transportation, as well as to protect them from corrosion during storage of military equipment, etc. broadly used in turfs. Petroleum acids are present in the oxygenated compounds of oil in a potential amount, and they are of actual importance because they enable the separation from oil and the purchase of various valuable industrial products based on it. Products obtained as a result of synthesis reactions based on petroleum acids have a widespread field of application. Synthesis of esters, salts, complexes and nitrogen-containing derivatives of petroleum and individual carboxylic acids and their further application as corrosion inhibitors are vital issues. As a result of the research conducted in the field of synthesis of nitrogen-containing derivatives of petroleum and individual carbonic acids, the idea was formed that the way to achieve an effective result is to create high-quality corrosion inhibitors that are soluble in hydrocarbons. As a result of literature research, it was found that compounds containing nitrogen are the inhibitors with the highest results in corrosion protection. Taking into account the above, taking into account the need for petroleum acids and derivatives based on them, the synthesis of synthetic petroleum acids along with natural petroleum acids and the purchase of practically important products based on them is considered appropriate. From this point of view, in the presented research work, imidazoline N-chloropropyl α -naphthylacetate complex of synthetic petroleum acid was synthesized. The structure of the synthesized complex was confirmed by IR spectral analysis, which is a contemporary analytical technique. The bactericidal property of imidazoline N-chloropropyl α -naphthylacetate complex of synthetic petroleum acid was considered and it was resolved that this complex has a protective effect of 98.8-99% at a concentration of 5-10 mg/l and 100% at a concentration of 15 mg/l.

Keywords: corrosion, biological damage, synthetic naphthenic acids, imidazoline, inhibitors, sulfate-reducing bacteria

Introduction

Corrosion remnants as an ever-present problem. In their research in this field, scientists are looking for solutions to both economic and disaster-causing problems, as well as trying to preserve many materials-metals that are important for our economy. Metal reserves in the world are limited, along with metal loss, additional energy and water loss continues. The damage triggered by corrosion to the economy is measured in billions of US dollars. Corrosion problem leads to loss of finished product (during oil, gas, water treatment), decrease in production power (heat exchange worsens due to rust deposition, internal diameter of pipelines decreases, increase in power of pumps), product contamination [1, 2]

The cause of corrosion is the thermodynamic instability of metals. Metal parts of machines and mechanisms, reservoirs and pipelines try to become more stable oxidized (ionic) under operating conditions. The spontaneous transformation of metals into such a stable state means corrosion [3-7].

The most operative process of corrosion protection, both from the economic point of view and from the point of view of straightforwardness, is the application of inhibitors. As a result of the literature research, the production of imidazolines based on natural petroleum acids and various amines, as well as the training of complexes of these synthesized imidazolines with fatty acids were investigated. Nitrogenous corrosion inhibitors are also effective in inhibiting the growth of sulfate-reducing bacteria. As is known, H₂S contained in crude oil is of biogenic origin. Special favorable conditions for microbiological processes

are created when oil layers are injected with water taken from a river, the sea, or, in general, highly mineralized water. Among the types of bacteria, sulfate-reducing and thion bacteria cause greater damage. 80% of corroded oil well equipment is corroded by sulfate-reducing bacteria.

New approaches are created and inhibitors are proposed as an upshot of the recent scientific-research works to prevent the growth and life activity of sulfate-reducing bacteria, to prevent hydrogen-sulfide corrosion caused by these bacteria. In the presented research work, imidazoline of synthetic petroleum acid was first synthesized according to the known methodology [1].

Experimental part

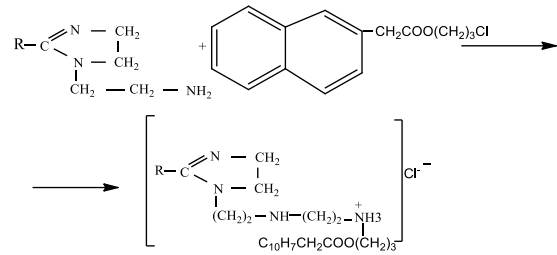
Synthetic petroleum acid was obtained by catalytic oxidation of naphthenic-isoparaffinic hydrocarbons of the fraction boiling at a temperature of 250-3500C. The yield of the obtained synthetic petroleum acid is 30%. The physical and chemical parameters of the synthetic petroleum acid are given below.

Table 1: Physico-chemical parameters of synthetic petroleum acid

Relative molecular mass	238.2
Acid number	235
Refractive coefficient	1,4665
Density at 20 ⁰ C, kg/m ³	0.9875
Freezing temperature, ⁰ C	-35
Boiling temperature, ⁰ C	260-360

Imidazoline is synthesized at a temperature of 240 °C with synthesized synthetic petroleum acid diethylenetriamine (DETA). In order to synthesize the N-chloropropyl α -naphthylacetate complex of imidazoline of synthetic petroleum acid, the imidazoline of synthetic petroleum acid and N-chloropropyl α -naphthylacetate taken in a ratio of 1:1 were reacted in a round-bottomed flask at a temperature of 130 °C for 3 hours using isopropyl alcohol (25 ml) as a solvent according to the following scheme. As a result, the yield of the synthesized complex was 96 mass %. A number of physical and chemical indicators of the complex were determined. Imidazoline is synthesized at a temperature of 240 °C with synthetic petroleum acid diethylenetriamine (DETA).

In order to synthesize the N-chloropropyl α -naphthylacetate complex of imidazoline of synthetic petroleum acid, the imidazoline of synthetic petroleum acid and N-chloropropyl α -naphthylacetate taken in a ratio of 1:1 were reacted in a round-bottomed flask at a temperature of 1300C for 3 hours using isopropyl alcohol (25 ml) as a solvent. according to the following scheme. As a result, the yield of the synthesized n_d^{20} 1,5054; d_4^{20} 1,0310; γ_{40} 150,0



where R- is the SPA (synthetic petroleum acid) radical. The following absorption bands were detected in the IR spectral analysis of the N-chloropropyl α -naphthylacetate complex of imidazoline of synthetic petroleum acid: Deformation and valence (1455, 1375, 2856, , 2925, 2963 cm⁻¹) vibrations for the C-H bond in the CH₂ and CH₃ group, deformation (780, 817, 857, 1599 cm⁻¹) vibrations for the C-H bond in the benzene ring, asymmetric vibrations (1019, 1057 cm⁻¹) for the C-O bond in the complex ether group, valence (1737 cm⁻¹) vibrations for the C=O bond of the complex ether, (1545, 1644 cm⁻¹) vibrations for the C=N bond, HH⁺, HH, HH₂ group deformation (1512, 1548 cm⁻¹) and valence (3289 cm⁻¹) oscillations for the N-H bond and valence (1129, 1159 cm⁻¹) oscillations for the C-N bond are observed.

Table 2: The physicochemical parameters of synthesized synthetic petroleum acid N-chloro propyl α -naphthylacetate imidazoline complex

The name of the compound	n_d^{20}	d_4^{20} , q/sm ³	γ_{60}	Output, mass %
N-chloro propyl α -naphthylacetate imidazoline complex of synthetic petroleum acid	1,5115	1,0180	148,20	96

Conclusion

The synthesized complex was experienced in microbiological corrosion and the protection effect was plaid. It should be distinguished that bactericidal-inhibitors are widely used in microbiological corrosion, but there are no universal bactericides to date. In this regard, it is appropriate to synthesize new bactericides. In the table

below, the effect of SPA (synthetic petroleum acid) imidazoline chlorine complex on the life activity of bacteria at different concentrations was investigated. Desulfobrio desulfuricans strain 1143 from the Absheron-Binagadi field was used as the research object. The influence of sulfate-reducing bacteria on the incubation period for 15 days was considered.

Table 3: Effect of SPA imidazoline chlorine complex over the life activity of bacteria at different concentrations

Name of the complex	Concentration of the substance, C- mg/l/	The amount of bacteria cell/mg	Amount of H ₂ S mg/l	Protection effect Z, %
Environment - I The amount of H ₂ S in the medium without the test culture – 32 mg/l	5	10 ¹	3.2	98.8
Environment - II / The amount of H ₂ S in the medium with the test culture – 275 mg/l	10	10 ¹	2.4	99.1
Environment - III The amount of bacteria in the culture medium -10 ⁸ number of cells / ml	15	–	–	100

As can be perceived from the table, the N-chloro propyl α -naphthylacetate imidazoline complex of synthetic petroleum acid displays 98.8-99% bactericidal effect at a concentration of 5-10 mg/l, and 100% bactericidal effect at a concentration of 15 mg/l.

In the presented research work, as in the previous investigations of α -naphthyl acetic acid [5], the chloro complex of α -naphthyl acetic acid was synthesized. The inhibitory property of the compound obtained in the presence of isopropyl alcohol was researched on the basis of the interaction effect of chloro ether with the amide of synthetic petroleum acid and the corrosion property was checked in different environments (carbon dioxide, hydrogen sulfide and bio-corrosion). Chloride complexes of

synthesized synthetic petroleum acids were determined during the bio-corrosion effect, the effect of this complex on the life activity of sulfate reducing bacteria was determined in 3 concentrations for 15 days at 30 °C.

In the end, it was concluded that N-chloropropyl α -naphthylacetate ester of synthetic petroleum acid has bactericidal properties and displays a highly effective protective effect in the bio-corrosion of metals as an inhibitor. The synthesized chlorine complex was simultaneously verified as a corrosion inhibitor in both carbon dioxide and hydrogen sulfide environments and it was resolved that it showed a 100% protective effect even at the lowest concentrations (5, 10, 15 mg/10) in hydrogen sulfide environments. It was accepted out by taking 9:1 ratio

of water: kerosene, which is a 2-phase system as it is known in hydrogen sulphide environment.

The water here is saturated with hydrogen sulfide up to 500 mg/l. The experiment was carried out on Steel-3 plates (boards) for 5 hours by equipping the environment with a magnetic stirrer. In the carbon dioxide environment, it demonstrates a 90% protective effect at a concentration of 100 ppm. In the end, it can be concluded that because the synthesized complex shows a high protective effect in the above-mentioned environments (H₂S, CO₂, bio-corrosion), it can be considered appropriate to offer it as a corrosion inhibitor.

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