APPLICATION OF BUTINE-2-DIOL-1,4 DIFORMIATE AND BUTINE-2-DIOL-1,4 DIACETATES AGAINST BIOCORROSION OF METAL STRUCTURES IN THE OIL AND GAS INDUSTRY

Nizamov Isomiddin G‘iyos o‘g‘li
Tashkent State Pedagogical University After named Nizomiy
Faculty of Natural Sciences Department of Chemistry and Methods of Teaching Chemistry
Phone:+998917934545 Email:isomiddin.nizamov@mail.ru
Turg‘unov Erxan
Tashkent State Pedagogical University After named Nizomiy
Faculty of Natural Sciences Department of Chemistry and Methods of Teaching Chemistry,
Doctor of Chemical Sciences, Professor
Phone:+998887449904 E-mail: erxon1955@yandex.ru
Faxriyev Shohnur Shahobiddin o’gli
Research Assistant
Phone:+998909150955 E-mail: shohnur1234@gmail.com

Abstract *This article provides information on the application of acetylene alcohols and their complex esters in the oil, gas, and metallurgy industries. In addition, the effects of Butine-2-diol-1,4 diacetate and Butine-2-diol-1,4 diformiate on bacteria that cause biological corrosion of metals have been studied.*

Keywords: *acetylene alcohols, Butine-2-diol-1,4, corrosion, microorganisms, bacteria, inhibitor*

Introduction

In recent years, a number of environmental, economic and technological problems are also observed as a result of the rapid modernization of the oil and gas, metallurgical, pharmaceutical and chemical industries, the launch of new production enterprises. As a result of the research work carried out by scientists of our country in recent years, it can be noted that a number of metal and steel structures used in the food, chemical and oil and gas industries are producing a new generation of preprats and materials that are effective against casting and layer-forming components [[1]; 113-b.].

The fact that metals corrode as a result of chemical, electrochemical and biological processes leads to a huge amount of economic and metal losses to this day. Under the influence of various microorganisms present in the soil, natural

minerals and deposits, biocorrosion processes are formed as a result of the decay of metals and structures prepared on their basis. Bacteria that cause biocorrosion in particular are found in large quantities in petroleum van eft products, causing several problems in the oil and gas industry as a result of their proliferation, development, source of nutrients and the presence of sufficient conditions for life [2; 186-187 b.].

Usually biological corrosion occurs quickly in different environments and conditions. Microorganisms, on the other hand, are formed as a result of waste from living organisms such as bacteria, fungi, mosses, lichens and occur in parallel with soil, water and Atmospheric corrosion. As a result of the joint action of all microorganisms in the process of biocorrosion, they are divided into aerobic and anaerobic species [3; 23-29 b. 4; 71-75 b.].

Technological devices, Tool Equipment and metal structures used in the extraction, transportation, storage and processing of oil and oil products are subject to biocorrosion under the influence of various microorganisms. For this reason, microorganisms found in the composition of oil and petroleum products. Determining their types and composition, studying the reasons for causing the process of biocorrosion are considered important problems that are waiting for a solution in scientific and practical terms [5; 160-164 b. 6; 55-58 b. 7; 209 b.].

From the complex ethers of Butine-2-diol-1,4, synthesized from the above problems, samples of Butine-2-diol-1,4 diformiates and Butine-2-diol-1,4 diacetates are used in the processing of oil and petroleum products, microorganisms that cause biocorrosion of metal devices, equipment and steel structures - on the microbiological activity of pereparates, which are recommended for use as bioingibitors against bacteria and fungi, research work was carried out in the Laboratory of Industrial Microbiology of the Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan.

During these studies, iron bacteria have been identified as the causative agents of aerobic corrosion, and sulfate-reducing bacteria of Desulfovibrio and

Desulfotmaculum species have been identified as the primary causative agents in anaerobic (oxygen-free environment) corrosion.

Studying the qualitative and quantitative composition of microflora, among the families of bacteria involved in the processes of oil-destructive processes and biocorrosion of metal surfaces, the most common are: Pseudomonaceae, Micrococcaceae, Rhodococcaceae, Vibrionaceae, Desulfovibrioceae. Pure bacterial cultures identified based on studies of bacterial cultures and their morphological-physiological characteristics have been found to belong to Pseudomonas, Arthrobacter, Micrococcus, Acinetobacter, Rhodococcus, Desulfovibrio species.

Research method. The sampling scale was carried out when the temperature of the external environment was 8-40 °C. Samples were taken from the surfaces of oil pipelines, pumps, active bores, oil reserves and other oilfield equipment (saskobs) to isolate corrosive pathogens. The microbiological planting process was carried out in liquid and solid minerality tumors in Raymond (g/L): KNO_3-1.0; Na_2HPO_4-0.8; K_3PO_4-0.14; $MgSO_4$-0.1; NaCl-1.0; distilled water-1 part; sterile oil-1-1.5%. Planting crops were placed in Petri dishes and incubated in a thermostat at a temperature of 20-30 °C, then continued in a polytermostat.

More than ninety pure bacterial cultures have been isolated from the samples taken. To do this, from individual colonies grown in a harsh feeding environment, planting in agar-agar surface was carried out, which was added to test tubes, for planting in agar environment. If the growth is the same in the process, the microorganisms from this test tube are prepared and placed in petri dishes for planting in a harsh environment again. The colonies formed during the growing season were uniform in appearance. The purity of the cultures was examined by light microscopy.

Experience 1. In a sterile flask, Butine-2-diol-1.4 diacetate was added to the selective nutrient medium (control) contained in Raymond at a concentration of 40 mg/l, which was planted in a petri dish with a drop (0.20 ml) from the test tubes containing the bacterial suspension. The flask was also prepared by adding 1 liter of

Raymond agar-agar medium to Butine-2-diol-1.4 diacetate from concentrations up to 100 mg/L. Then, an inhibitor was added to the agar-agar environment, poured into petri dishes, and a drop (0.20 ml) was added to the surface from a bacterial suspension prepared in sterile test tubes. Petri dishes were placed in a thermostat at a temperature of 26-28 °C, and observations of colony growth were carried out for 7 days. As a result of experiments, it was found that there is absolutely no growth of bacterial colonies at a concentration of 40 mg/l among the tested concentrations, which means that this concentration was confirmed to be a lethal concentration that kills bacteria – microorganisms that cause corrosion-by 100%.

Experience 2. A Butine-2-diol-1,4 diacetate was added to the selective nutrient medium (control) contained in Raymond to the sterile flask at a concentration of 20 mg/L. A drop (0.20 ml) was taken from the test tubes where the bacterial suspension was located and planted in a petri dish. The flask was also prepared by adding Butine-2-diol-1.4 diacetate to the agar-agar medium in 1 liter of Raymond at concentrations up to 60 mg/l. Then, an inhibitor was added to the agar-agar environment, poured into petri dishes, and a drop (0.20 ml) was added to the surface from a bacterial suspension prepared in sterile test tubes. Petri dishes were placed in a thermostat at a temperature of 26-28 °C, and observations of colony growth were carried out for 7 days. As a result of experiments, it was found that the growth of bacterial colonies at a concentration of 20 mg/l is completely absent among the tested concentrations, which means that this concentration is confirmed to be a lethal concentration that kills bacteria – microorganisms that cause corrosion-by 100%.

Experience 3. A Butine-2-diol-1,4 diformiate was added to the selective nutrient medium (control) contained in Raymond in a concentration of 500 mg/l to the sterile flask. A drop (0.20 ml) was taken from the test tubes where the bacterial suspension was located and planted in a petri dish. The flask was also prepared by adding Butine-2-diol-1.4 diformiate to the agar-agar medium in 1 liter of Raymond at concentrations up to 20,000 mg/l. Then, an inhibitor was added to the agar-agar

environment, poured into petri dishes, and a drop (0.20 ml) was added to the surface from a bacterial suspension prepared in sterile test tubes. Petri dishes were placed in a thermostat at a temperature of 26-28 °C, and observations of colony growth were carried out for 7 days. As a result of the experiments, it was found that the growth of bacterial colonies at a concentration of 500 mg/l decreased among the tested concentrations, which means that this concentration was confirmed to be a lethal concentration that kills bacteria – microorganisms that cause corrosion-at a level of 25%.

Experiment 4. Butin-2-diol-1.4 was added to the sterile flask up to a concentration of 1000 mg/l in the selective nutrient medium (control) contained in Raymond and planted in a petri dish with a drop (0.20 ml) from the test tubes containing bacterial suspensions. The flask was also prepared by adding 1 liter of Raymond agar-agar medium to Butine-2-diol-1.4 at concentrations up to 5,000 mg/l. Then, an inhibitor was added to the agar-agar environment, poured into petri dishes, and a drop (0.20 ml) was added to the surface from a bacterial suspension prepared in sterile test tubes. Petri dishes were placed in a thermostat at a temperature of 26-28 °C, and observations of colony growth were carried out for 7 days. As a result of the experiments, it was found that the growth of bacterial colonies at a concentration of 1000 mg/l decreased among the tested concentrations, which means that this concentration was confirmed to be a lethal concentration that kills bacteria – microorganisms that cause corrosion-at a level of 10%.

Based on the acetylene compounds studied, the following biocorrosion inhibitors were developed: Butine-2-diol-1,4 diacetate; Butine-2-diol-1,4 diformate and Butine-2-diol-1,4. Their effects have been identified on sulfate-reducing bacteria, which are the main causative agents of pipeline biocorrosion in oil fields. The bacteriosidic and bacteriostatic activity of synthetic acetylene alcohols is shown in Table 1.

Table 1.

Bacteriostatic activity of bactericides and inhibitors

№	Bactericidal and synthetic inhibitors	Bacteriostatic activity			Bactericidal activity		
		Concen-tration, mg / l	Bacterial cells		Concen-tration, mg / l	Bacterial cells	
			alive	dead		alive	dead
1	Butin-2-diol-1,4 diatsetat	40	0	100	100	0	99,9
2	Butin-2-diol-1,4 diformiat	20	0	100	60	0	100
3	Butin-2-diol-1,4	1000	90	10	5000	88	12

The studies used Raimonda and Muns nourishing environments in which the above-mentioned synthesized preparations were added at concentrations ranging from 1 mg/l to 1000 mg/l (in the 20 mg/l range). As a control, these nourishing environments were used, but not in the case of the addition of biocides.

A study of the effects of anti-corrosion drugs on the activity of bacteria that produce sulfate reduction has revealed their bacteriosidic and bacteriostatic activities. Among the studied biocides, Butine-2-diol-1,4 diformate was found to be the most effective and promising, and it is recommended to undergo wider tests to combat microbial corrosion of oilfield equipment.

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