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INDUSTRIAL USE AND EFFECTIVENESS DETERMINATION OF INHIBITORS BASED ON BISICLIC ORGANIC SULFUR COMPOUNDS

Guzal Rakhmatova
Doctor of philosophy (PhD),
Karshi Enginerering Economics Institute,
Republic of Uzbekistan, Karshi
E-mail: raxmatova85guzal@mail.ru

ПРОМЫШЛЕННОЕ ПРИМЕНЕНИЕ И ОПРЕДЕЛЕНИЕ ЭФФЕКТИВНОСТИ ПОЛУЧЕННЫХ ИНГИБИТОРОВ НА ОСНОВЕ БИЦИКЛИЧЕСКИХ ОРГАНИЧЕСКИХ СОЕДИНЕНИЙ СЕРЫ

Рахматова Гузал Ботировна
канд. техн. наук,
Каршинского инженерно-экономического института,
Республика Узбекистан, г. Карши

ABSTRACT

In this article, the inhibition process of inhibitors containing α-morpholino-2-methyl-5-acetyl-1-thiain (AIT-1) and α-morpholino-6-acetyl-1-thiochroman (AIT-2) in industrial devices and its effectiveness results given.

АННОТАЦИЯ

В статье приведены процесс ингибирования ингибиторами, содержащими α-морфолино-2-метил-5-ацетил-1-тиаин (АИТ-1) и α-морфолино-6-ацетил-1-тиохроман (АИТ-1) и результаты его эффективности в промышленных установках.

Keywords: Oil, Pipeline, Gas, Inhibitor, Corrosion, Hydrogen Sulfide, Carbon Dioxide.
Ключевые слова: нефть, трубопровод, газ, ингибитор, коррозия, сероводо-род, углекислый газ.

Introduction

In the oil and gas industry, the use of inhibitors is one of the main methods of preventing corrosion of metals. In particular, as in all countries, the demand for inhibitors is very strong due to the fact that there are many problems in the processing plants of gases coming from fields rich in hydrogen sulfide. The use of corrosion inhibitors in industry is unique, and when the inhibitor is used, it is necessary to protect all devices in the technological chain: pipelines, pipelines, gas processing plants, and in their application, new aspects of technological processes, new requirements it is necessary to satisfy.

It is known that hydrogen sulfide, carbon dioxide, and low molecular organic acids are constantly present in natural gas, and the use of inhibitors based on organic compounds in ensuring the technical approval and economic efficiency of corrosion protection of construction materials is a confirmation. found In order to use inhibitors on an industrial scale, they must meet certain requirements. The greatest demand for inhibitors depends on their effective protection of construction materials from corrosion. In the last place, when choosing inhibitors for different situations, importance is given to the technological features of their application. In this case, the requirement for an inhibitor is determined taking into account a number of conditions. Including physico-chemical properties of its composition and environment, as well as parameters of technological processes. In addition, gas extraction, preparation of gas and condensate, processing technology of extracted products, structural features of structures, etc. are taken into account.

The use of inhibitors on an industrial scale can be carried out on a partial and full scale. Full-scale inhibitor testing or application provides complete information about the inhibitor, but is rarely used due to its high cost. Partial implementation of testing or application of inhibitors is more desirable from a practical point of view.

In order to apply it on an industrial scale, it is recommended to clarify the inhibition process based on the preliminary results of the inhibitors and give the final conclusions on all parameters. When using corrosion inhibitors in industrial conditions, the effectiveness of their level of protection is determined by the following parameters:

- the effect of the inhibitor on the mechanical (plastic) property of the metal;
- saturation of metal with hydrogen under the influence of inhibitor;
- the type of structures and the rate of corrosion in them;
- concentration of corrosion inhibitor;

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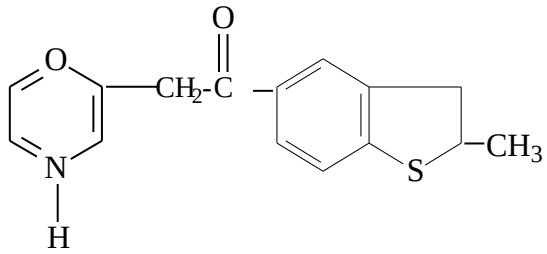
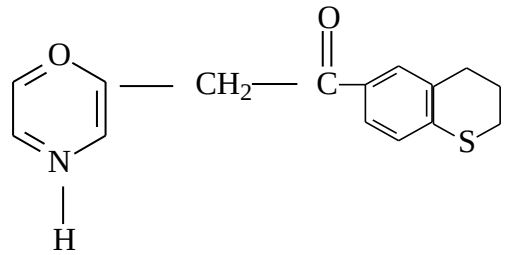
- parameters affecting technological processes;
- determine the viscosity of the inhibitor;
- -determining the solidification temperature of the inhibitor;
- determination of the ignition temperature of the inhibitor;
- determining the solubility (dispersibility) of the inhibitor;
- the parameters of the inhibitor, such as its tendency to emulsification, are studied.

Materials and metods

Synthesized by us at the same site from α-morpholino-2-methyl-5-acetyl-1-thiain (AIT-1),



α-morpholino-6-acetyl-1-thiochroman (AIT-2)



substances were selected.It was used on an industrial scale as a test at the Mubarak gas processing plant. The ability of selected inhibitors to protect metals from corrosion was determined by test-experimental work under normal conditions in aggressive environments.

In accordance with the procedure for conducting experimental industrial tests, in order to determine the rate of control (without inhibitor) corrosion as a corrosion inhibitor, samples of corrosion were installed in each test object, and preparatory work on tests of corrosion inhibitors in the absorbers and gas pipelines of the Mubarak gas processing plant was carried out. was carried out.

As mentioned above, the use of inhibitors was carried out in some parts of the devices (absorbers). It is known that diethanolamine and methyldiethanolamine are used as absorbents for cleaning natural gas from hydrogen sulfide and carbon dioxide at the Mubarak gas processing plant. Corrosion inhibitor, like any surfactant, can increase the foaming process after entering the working solution. This can disrupt the working mode of the installation and reduce its efficiency in terms of gas production.

In the evaluation of the foaming properties of the inhibitors given for research, in the factory laboratory, "Absorbents for cleaning natural gases from hydrogen sulfide and carbon dioxide. Methodical manual VNIIGAZ R51-00158623-11-95 entitled "Determining the property of foaming" was used. The research was carried out in a barbatage type column. A 20% (by volume) solution of diethanolamine was placed in the column and blown with nitrogen gas at different linear velocities.

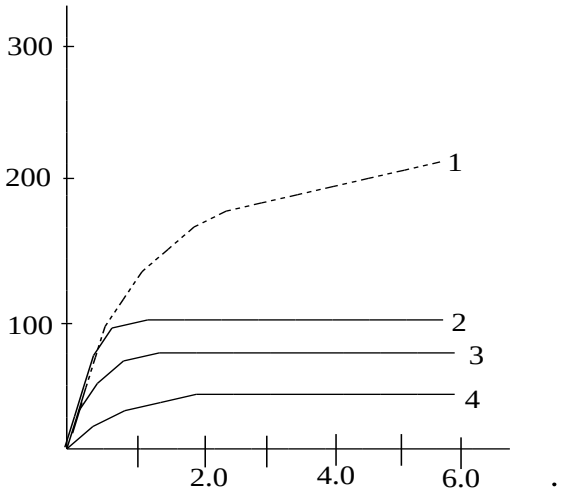


Figure 1. 1-initial mixture; 2-AIT-1; 3-AIT-2; 4-IXFANGAZ

Rezults

Foam properties include its height and stability. As can be seen from the picture, the degree of foaming of the initial solution is very high. The choice of inhibitors is significantly influenced by the propensity to foam in the protection of gas pipelines in gas processing plants. In the same place, their concentrations are also important in evaluating the foaming properties of inhibitors. In this study, a 500 mg/l solution of digital inhibitors AIT-1 and AIT-2 was used for research. Increasing the concentration of inhibitors causes an increase in the degree of foaming in all cases. When compared with the antifoaming agent IFXANGAZ used at the Mubarak gas processing plant, it was found that the recommended inhibitors do not increase the foaming level in the absorber.

The effect of the proposed inhibitors on emulsification in the liquid hydrocarbon-water system was also studied. In the complex production of gases, it is necessary to separate the hydrocarbon part from the hydrocarbon-water mixture on a factory scale. Corrosion inhibitors that protect pipes, technological equipment and pipelines from corrosion should never reduce the processes of separation separation of hydrocarbon condensate-water mixture. Otherwise, improper or long-term separation of the emulsion leads to the violation of the technological regime of the separator structures, and as a result, the loss of hydrocarbon condensate occurs. The effect of the proposed inhibitors on emulsification was carried out at room temperature using a stirrer designed for continuous stirring in a transparent cylinder with a diameter of 50 ml. For this, one of the two cylinders was filled with hydrocarbon condensate and plastic water in a ratio of 1:1. For the second, under the

same conditions, 1:1 solutions of the inhibitor with a concentration of 500 mg/l were taken, taking into account hydrocarbon condensate and plastic water. From the obtained samples, the hydrocarbon condensate-water mixture in the first cylinder was mixed for 10 minutes, and the separation time of the resulting emulsion was 11 minutes. The mixtures in the cylinder containing the hydrocarbon condensate-water-inhibitor solution in the second cylinder were also intensively mixed for 10 minutes. Then the separation of the formed emulsion was observed. As a result, it was found that the complete separation of the emulsion was 10-11 minutes. From the obtained results, it can be concluded that the AIT type inhibitors, which are used in the transmission of gases through pipelines and in the separation of residual plastic water in the gas, do not affect the separation process of the hydrocarbon condensate-water mixture in the separation equipment and, on the contrary, prevent the corrosion of this equipment.

According to clause 5.3 of the Guideline document NGH (RH)39.0-051:2007, the protective effect determined by the gravimetric method on steel samples against general corrosion at a concentration not higher than 500 mg/l should not be less than 90%.

The protective effect of AIT-1 and AIT-2 corrosion inhibitors meets the requirements of NGH (RH)39.0-051:2007 (Table 1). Table 1 shows the results of experimental industrial tests conducted in aqueous phase and water-hydrocarbon condensate emulsion.

Results of corrosion tests conducted in accordance with NGH (RH)39.0-051:2007 in aqueous phase and water-hydrocarbon condensate emulsion

Table 1.

The results of experimental industrial tests conducted in aqueous phase and water-hydrocarbon condensate emulsion

Code of corrosion inhibitor	A series of tests	Inhibitor concentration in the medium to be tested (g)	Protection level,%		Compliance with the requirements of NGH (RH)39.0-051:2007
			Water-hydrocarbon condensate in emulsion	In the water phase	
AIT-2	1	5.0±1	98,3	99,4	fits

Conclusion

According to clause 5.4 of the guiding document NGH (RH)39.0-051:2007, the protective ability of corrosion inhibitor should not be less than 90% for water-hydrocarbon condensate emulsion. AIT-2 brand corrosion inhibitor exhibits a high level of protection in the environment of water-hydrocarbon condensate emulsion and aqueous phases, and it meets the requirements of NGH (RH)39.0-051:2007.

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