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CHROMATOMATIC MASS ANALYSIS OF DIVINYLACETYLENE DERIVATIVE OF PHTHALIC ANHYDRIDE

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ХРОМАТО-МАССОВЫЙ АНАЛИЗ ДИВИНИЛАЦЕТИЛЕНОВОГО ПРОИЗВОДНОГО ФТАЛЕВОГО АНГИДРИДА

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ABSTRACT

The corrosion process of technological apparatuses of the chemical industry is one of the urgent problems. Since due to the corrosion process, metal equipment, equipment, structures and devices quickly fail, resulting in great economic damage. Various methods and corrosion inhibitors are used to reduce this level of damage. This scientific article provides information on the analysis of the chromato-mass spectrum of the divinylacetylene derivative of phthalic anhydride, which is the basis of a newly synthesized corrosion inhibitor.

АННОТАЦИЯ

Коррозионный процесс технологических аппаратов химической промышленности является одной из актуальных проблем. Так как вследствие процесса коррозии происходит быстрый выход из строя металлического оборудования, оборудования, конструкций и устройств, в результате чего наносится большой экономический ущерб. Для снижения этого уровня повреждений используются различные методы и ингибиторы коррозии. В данной научной статье приведены сведения об анализе хромато-массового спектра дивинилацетиленового производного фталевого ангидрида, являющегося основой вновь синтезированного ингибитора коррозии.

Keywords: MDEA (methyldiethanolamine), corrosion, divinylacetylene derivative of phthalic anhydride, corrosion inhibitor, sulfuric acid, dipropynyl ion of phthalanhydride, chromato-mass spectrum, IR (infra red) spectrum

Ключевые слова: МДЭА (метилдиэтаноламин), коррозия, дивинилацетиленовое производное фталевого ангидрида, ингибитор коррозии, серная кислота, дипропинил-ион фталевого ангидрида, хромато-масс-спектр, ИК (инфракрасный) спектр

Introduction

Corrosion of metal equipment and structures used in industrial networks is one of the urgent problems. Because every year a large part of the metal fund is lost due to corrosion.

In addition to such direct damage, there are also many indirect damages. They include the reduction of the capacity of metal equipment, damage caused by their forced shutdown due to accidents caused by corrosion, as well as costs for eliminating the consequences of accidents that often lead to environmental catastrophes [1-2].

Corrosion problems often occur in shell-and-tube heat exchangers used in the process of absorption purification of hydrocarbon gases from acidic components.

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Various methods and corrosion inhibitors are used to reduce this level of damage.

Aggressive medium consisting of MDEA (methyldiethanolamine) and sulfuric acid enters the shell-and-tube heat exchanger with a temperature of 50°C and leaves the device with a temperature of 80°C. The pressure in the heat exchanger is 1.66 kg s/cm^2 [3-4].

The proposed corrosion inhibitor is directly added to MDEA at a mass ratio of 0.05%. The corrosion inhibitor created on the basis of divinylacetylene derivative of phthalic anhydride blocks the corrosion process occurring in the heat exchange device during the circulation of natural gas in the process of absorption purification.

Below are the results of the chromato-mass spectrum of the divinylacetylene derivative of the synthesized phthalic anhydride and its analysis [5-6].

Research methodology

When determining the composition of the synthesized phthalic anhydride derivative with divinylacetylene, not only the IR (infra red) spectrum analysis, but also the chromato-mass spectrum of the substance (Fig. 1). Based on the analysis of the chromato-mass spectrum of the synthesized derivative of phthalic anhydride with divinylacetylene, a conclusion is made depending on the ions that can be formed during its decomposition [7-8].

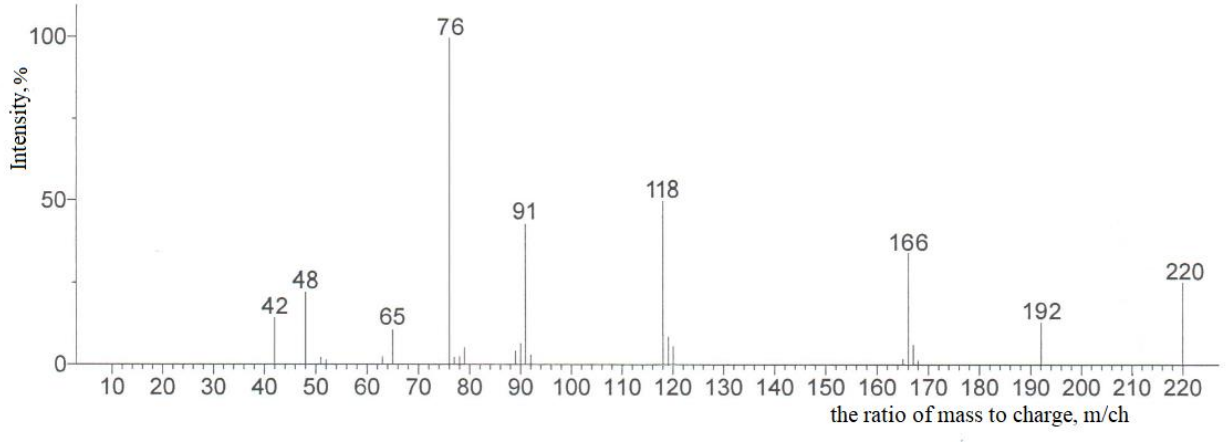
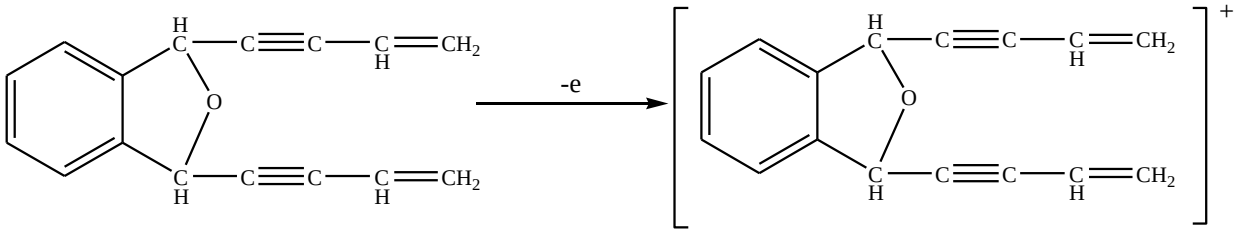


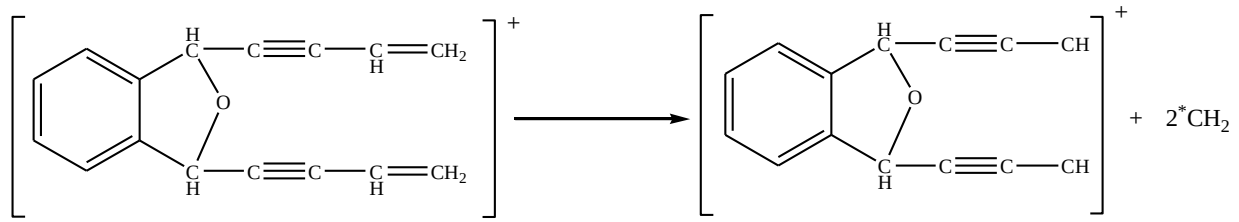
Figure 1.Chromato-mass spectrum of divinylacetylene derivative of phthalic anhydride

In this case, the molecular ion peak was equal to 220.0, corresponding to the molecular mass of the derivative of phthalic anhydride with divinylacetylene. Below is a scheme of the formation of fragment ions formed from the molecular ion of the divinylacetylene derivative of the initial phthalic anhydride.

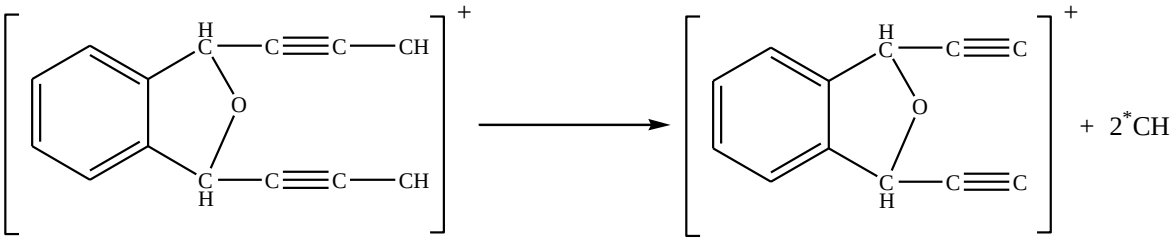
After entering the divinylacetylene derivative of phthalic anhydride into the chromato-mass spectrometer, a molecular ion of the divinylacetylene derivative of phthalic anhydride with a m/ch of 220.0 was formed between 9.179 and 9.272 minutes under the selected conditions.



In addition, the formation of fragment ions with mass m/ch 192, m/ch 166, m/ch 118, and m/ch 76 was determined in the spectrum. As a result of the release of the -CH_2 radical from the divinylacetylene derivative ion of phthalic anhydride at 9.179 minutes, the release of m/ch 192 ion was shown. This peak corresponds to the dipropynyl ion of phthalanhydride with m/ch 192 and is also consistent with these bond energies.

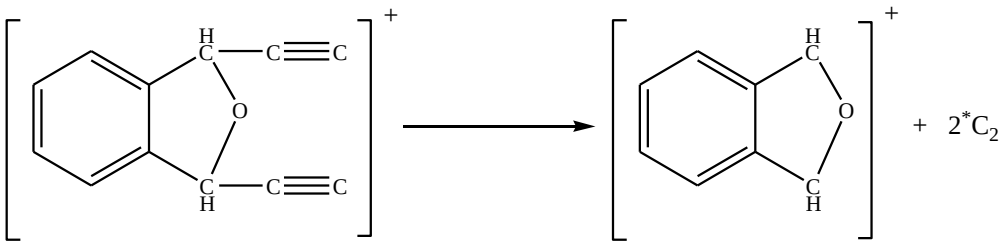


The separation of the m/ch 166 ion is manifested due to the release of the -CH radical from the dipropynyl ion of phthalanhydride. This peak corresponds to di-acetylenyl ion of phthalanhydride with m/ch 166.



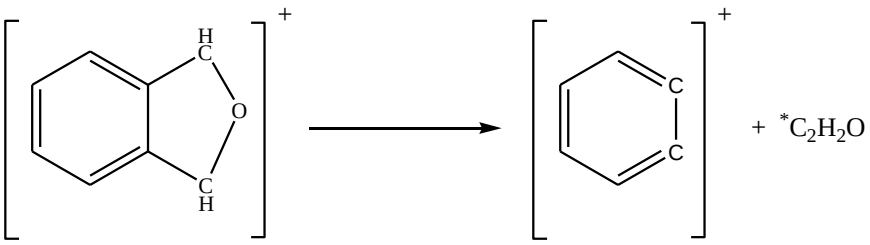
m/ch=192 m/ch=166 m/ch=26

At the same time, it can be seen that a fragment ion with m/ch 118 was formed from the release of ($-C_2$) radical from the decomposition of diacetylenyl ion of phthalanhydride. This peak corresponds to the phthalic anhydride ion with mass m/ch 118.



m/ch=166 m/ch=118 m/ch=48

In turn, the separation of m/ch 76 ion from the release of ($–C_2H_2O$) radical from methylene ethylene amine ion at 9.272 minutes was shown. This peak corresponds to C_6H_4 ion with m/ch 76.



m/ch=118 m/ch=76 m/ch=42

Summary

The kinetic laws of the ions formed at the end of the analysis also occur in accordance with the complexity of the opening of the ring. At the initial stage, the separation of the ions of the side chain and then the disintegration of the ring confirm the structure of the substance with its correctness and clear identification, compliance with the laws. [9] The results of the chromato-mass spectrum analysis confirmed that the synthesized substance is a derivative of phthalic anhydride with divinylacetylene.

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