

THE RESEARCH OF THE INFLUENCE OF THE ELECTRIC DISCHARGE ON THE GAS MEDIUM SF₆

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In the article the physicochemical processes, proceeding in the system under the influence of the electric discharge (SF₆ is the dielectric discharge), are investigated. Taking into consideration the content changes in the SF₆ gas medium, the results, confirming the strong influence of the gas medium and electric discharge on the materials, are presented.

Gas, named electric gas (elegas) SF₆, having high electric strength, has found wide use in the high-voltage technique as an insulator [1,2,3]. In spite of the fact, that the elegas, consisting of two chemically active atoms and being passive in the form of the SF₆ molecule, creates the medium, conserving its simplicity for a long time, and provides the stable work of the high-voltage equipment.

The mechanism of the elegas molecule formation and the connection nature of the new sulphur atoms and six fluorine atoms have not been studied. Until last years the elegas molecule formation and the idea on the creation of the six covalent connection between sulphur atoms and six fluorine atoms were submitted as a common hypothesis. The results of the research, conducted in the last years, have called the hypothesis and the mechanism of the SF₆ molecule formation in questions [4]: the idea of the electron charge transformation from sulphur atoms into fluorine atoms has been put forward. Thus, in the SF₆ molecule the presence of the covalent and ion connection is taken into consideration. According to the two mechanisms, the SF₆ molecule, having the high symmetry, is formed at the expense of the location of sulphur atoms in the center and fluorine atoms at the octahedral corners. As in the molecule structure the distance between the sulphur and fluorine atoms is low, the numerical value $1,57 \cdot 10^{-10}$ has been determined.

The high symmetry and compression, observed in the elegas molecule, provide the resistance to the physicochemical influence.

As the elegas is subject to the electric discharge influence, a number of changes occur in the SF₆ molecule and it may have the negative effect on the elegas medium. From this point of view SF₆, subjected to the electric influence, has the scientific-technical value in the research of the gas medium [3].

The influence of the torch (flare) electric discharge has been used in experiments. The electrode system, forming the torch electric discharge, enters the close volume and the discharge regime is chosen by the application of the variable voltage on the electrodes. In the case of the value of the applied high voltage is $U=25$ kV, the value of the electric current is 35 mA.

After the receipt of the vacuum in the system 10^{-6} Pa experiments were conducted by the introduction of the SF₆ gas in the system before the atmospheric pressure. In the close system applying the influence of the electric discharge on the SF₆ gas the changes in the gas medium have been registered by the mass-spectrometer.

The spectrogram, registered by the SF₆ gas in the system, is represented on fig.1.

As it is seen from the fig.1, the spectrogram consists of the SF₆ molecule and the residual gas of the atmosphere air. In spite of the presence of a low number of the water evaporation, oxygen, carbon, nitrogen atoms and molecules, SF₆ shows its neutrality.

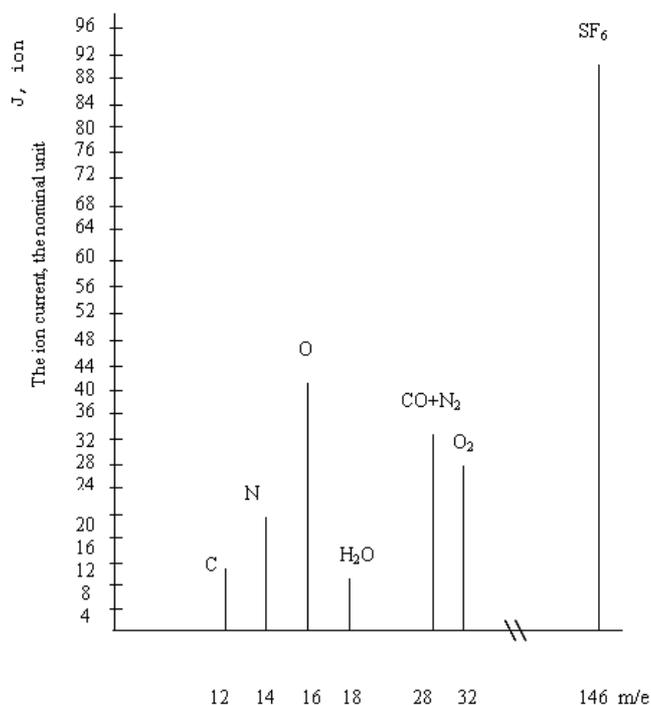


Fig.1. The mass-spectrogram, registered in the gas medium SF₆

In the above-presented regimes the spectrogram, registered by the influence of the torch electric discharge on the SF₆ gas, is represented on fig.2.

As it is seen from fig.2, the SF₆ gas (SF₆, SF₅, SF₄, SF₃, SF₂, SF, S, F) and another ions have been formed under the influence of the electric discharge. It should be noticed, that unlike SF₆ molecule the formed ions, being chemically active, have the strong influence on the gas atoms and molecules and contacting surface. Therefore, as it is seen from the mass-spectrogram, C₂F₅, C₂F₁₀, SOF₃, S₂N₃, SO₂F₂, SOF₄, SOF, SO₂, SO and another molecules have been formed like the above-presented gas SF₆.

On the spot of the drawn by the needle lines the traces of the depth 100-150 mc are observed on the surface of the ceramic plates and glass, whose surface is fully covered by the dielectric lacquer and placed on the surface of the flat electrode. The results shows, that the medium, formed under the effect of the electric discharge on the SF₆ gas and having

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QAZBOŞALMASININ SF₆ QAZ MÜHİTİNƏ TƏSİRİNİN TƏDQIQI

Məqalədə elektrik qazboşalmalarının təsiri nəticəsində «SF₆ – qazboşalması təsiri» sistemində müşahidə olunan fiziki proseslər tədqiq edilmişdir. SF₆ qaz mühitində tərkib dəyişmələri qeydə alınaraq, SF₆ qaz mühitinin, qazboşalmalarının təsiri şəraitində, materiallara güclü təsir vasitəsi olmasını təsdiqləyən nəticələr təqdim olunur.

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**ИССЛЕДОВАНИЕ ВОЗДЕЙСТВИЯ ЭЛЕКТРИЧЕСКОГО РАЗРЯДА
НА ГАЗОВУЮ СРЕДУ SF₆**

В статье представлены результаты исследований физико-химических процессов, происходящих в системе «SF₆ – воздействие электрического разряда». Выявлены изменения газовой среды SF₆ в условиях воздействия факельного электрического разряда. Установлены факты, подтверждающие химическую активность ионов элегаза, образованных вследствие воздействия электрического разряда.

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