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Electrification of Air as a Means of Controlling Hydrocarbons Combustion

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Abstract

It has previously been shown that internal combustion engines run longer on negatively charged gasoline without losing their power. In the course of searching for optimal methods of such electrification, over time it was concluded that the most suitable of them is the negative electrification of air, which forms a combustible mixture with gasoline. At the same time, the applicability of this electrification method to other hydrocarbons was studied. These studies demonstrated, in particular, that negatively charged air promotes the complete combustion of paraffin candles, while positively charged air hinders their complete combustion. Since visual confirmation of the difference in combustion of paraffin candles in air with an opposite charge is the most convincing, this method of confirmation was used here; in addition, it was taken into account that the effectiveness of this method of persuasion had previously been demonstrated by Faraday, who strongly recommended studying the chemistry of candle combustion.

Keywords: Electrification, Burning, Ignition, Theory.

Introduction.

Based on existing theoretical views, particularly Semenov's explosion theory [1], [2], a hypothesis was advanced that the negative electrification of gasoline facilitates its ignition in air. Specifically, it was postulated that the electrons added to gasoline increase the volume of the electron shells of its molecules, thereby increasing their reactivity and, consequently, facilitating their ignition in the presence of air. The results of an experimental test of this hypothesis generally confirmed its validity. It was found that the operating time of internal combustion engines using negatively charged gasoline is 20 ÷ 30% longer than that of the same engines using uncharged gasoline (it is important to note here that the negative electrification of gasoline was not accompanied by a reduction in the power of the engines used). At the same time, it was established that this effect of negatively charged gasoline manifests itself with sufficient air humidity; so, the maximum recorded increase in engine runtime for engines running on negatively charged gasoline (37%) was observed at air humidity close to 100%. accordingly, it was found that at air humidity of about 20%, the increase in the operating time of an engine fueled with negatively charged gasoline can be less than 5% [3]. Since the effect of air humidity mentioned above remained unclear, it was decided to study it separately and present the results of this study in the form of an article.

Materials and methods.

To obtain air currents with the same humidity and absolutely equal in magnitude, but opposite charges, the property of any horizontal air current to split in the Earth's magnetic field into two horizontal currents, respectively positively and negatively charged [4], [5], was used; the fact that under terrestrial conditions positive charges tend to move upward and negative charges downward even made it possible to visualize this splitting of air currents (Fig. 1).

To fully understand the content of the proposed visualization (Fig. 1), it is worth considering that it uses both the tendency of positively charged air to move upward and the tendency of negatively charged air to move downward: taking both of these trends into account, it becomes clear why the positively charged air flow does not come into contact with the starch powder located on the surface of the water in the left Petri dish (Fig. 1, left), while the negatively charged air flow rotates the starch powder located on the surface of the water in the right Petri dish clockwise (Fig. 1, right). Considering that paraffin is the same hydrocarbon as the previously studied gasoline [6], it was decided to study the combustion of paraffin candles.

Fig. 1. Petri dishes filled with water and coated with layers of starch powder were positioned on opposite sides of a horizontal air flow from a small cooler (marked with a blue arrow) [4], [5]

However, when choosing this specific object of study, both Faraday's experimental results and his call for further study of the chemical transformations occurring in burning candles [7], [8] were taken into account; at the same time, there was hope that burning candles would allow the effects being studied to be visualized.

All candles used had a diameter of 1 cm and an initial length of 15 cm. Before lighting, the candles were glued to a dry wooden board with melted paraffin: it was believed that the dielectric properties of both paraffin and dry wood [9], [10] could prevent the charge from leaking from electrified candles.

Results Thus, it was established that the combustion of paraffin candles located to the left and right of the horizontal air flow occurs differently. In particular, it was found that the length of a burning candle located to the left of the horizontal air flow decreases noticeably faster than the length of a burning candle located to the right of the horizontal air flow (Fig. 2).

In this experiment, both candles stopped burning when the length of the left candle (Fig. 2, left) reached approximately 3 cm (Fig. 3, in front); the length of the right candle (Fig. 2, right) at the same moment was approximately 10 cm (Fig. 3, in the distance).

Fig. 2. Burning candles are located to the left and right of the horizontal air flow created by the same color as in Fig. 1 (partially visible below).

Fig. 3. The same candles after the left candle has almost completely burned out.

Thus, it became clear that at the moment when both candles stopped burning, a significant part of the left candle (Fig. 2, left) had melted (Fig. 3, in front), while the melting of the right candle (Fig. 2, right) was not so noticeable (Fig. 3, in the distance).

Discussion

Thus, if this interpretation of the obtained results (Figs. 2, 3) is correct, it becomes clear that positively charged air promotes the melting of paraffin and, therefore, prevents its complete combustion. At the same time, it becomes clear that negatively charged air does not promote the melting of paraffin, but, on the contrary, promotes its complete combustion. Thus, considering each air flow (Fig. 1) as correspondingly electrifying paraffin, the obtained results (Figs. 2, 3) can be considered to be completely consistent with the results obtained in the study of internal combustion engines operating on formally uncharged and negatively charged gasoline [3]. It is worth noting that the term "uncharged" gasoline is used rather conditionally, since most terrestrial objects acquire a positive charge upon contact with air [11]; given this, it appears that this same study [3] was actually comparing the properties of positively and negatively charged gasoline. This is why it can be argued that the results presented here actually reflect the results obtained in studies of internal combustion engines running on formally uncharged and negatively charged gasoline [3].

While all these considerations seem quite compelling, the reason for the previously observed effect of air humidity on the efficiency of gasoline combustion in internal combustion engines remains questionable: in particular, the fact that internal combustion engines operate longer in air with high humidity [3] requires an adequate explanation. Perhaps, when attempting to explain this phenomenon, one should consider the results indicating that it is precisely the well-humidified air of the lower layers of the atmosphere that is saturated with negative ions [12], [13]. Thus, taking into account all these results, it appears that it is precisely the sufficiently high number of negative charges in humid air that promotes the complete combustion of gasoline in internal combustion engines, as noted earlier [3]. (In an effort to use these same results [12], [13] practically, one could, in particular, propose replacing the previously used methods of negative electrification of gasoline [3] with the supply of negatively charged air into the intake manifold of an internal combustion engine.)

(Be that as it may, it appears that all these considerations seem to be of use to those who are trying to explain the catalytic effect of water impurities on the reaction between gaseous hydrogen and oxygen, and who believe that absolutely dry hydrogen and oxygen do not interact with each other [6]. So, given the results presented here and those obtained previously [3], it is very likely that it is the negative charges carried by water vapor that provide this same catalytic effect. When analyzing this likelihood, it should be taken into account that the possibility of transferring negative charges by water vapor was not even previously suspected. Anyway, it appears that all the results discussed may be useful to those trying to improve the efficiency of internal combustion engines in a simple way; in any case, it is hoped that pre-negative charging of any combustion components will contribute to solving environmental problems caused by excessive fuel consumption.)

Conclusion

Thus, both the results presented here and those obtained previously indicate that the electrification of both hydrocarbons and air can significantly affect their properties that are important for the combustion process. In any case, it seems that all these results not only do not contradict the generally accepted theory of combustion [1], [2], but, on the contrary, testify in its favor.

At the same time, it seems that all these results can be very useful for understanding the fact that positive electrification of liquid hydrocarbons can promote their self-compression, thereby increasing their tendency to thermal melting, but not to combustion. It is probably worth adding that a similar tendency to self-compression is also observed in positively charged water and mercury [14]; this, in turn, allows assuming that the tendency in question is characteristic of all positively charged liquids. In any case, it seems that this article may well be seen as a completely adequate response to Faraday's call to investigate the peculiarities of candle combustion [7], [8].

Conflict of interest Author declares no conflict of interest.

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