STUDIES ON EXPLOSIVE REACTIONS OF TETRAFLUOROETHYLENE
AND ACETYLENE WITH OXYGEN OR AIR

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Introduction

A number of investigations have been made on the explosive reactions of lower unsaturated organic compounds, and have offered interesting results. The present authors studied an explosive reaction scarcely known and an explosive region undetermined by means of "admission" method in which gaseous samples were flowed into a hot vessel evacuated. The present experiment was performed in order to be compared with the data of the explosions under high pressure in this laboratory.

Tetrafluoroethylene in Part I is recently of industrial importance as a monomer of fluorocarbon compounds and the occurrence of explosion has been reported\(^1\), but any study has not been performed yet on the explosive reactions of tetrafluoroethylene-oxygen or air mixtures.

As to acetylene in Part II many studies have been reported by means of various experimental methods, but on the explosions of acetylene-oxygen mixtures by the admission method relatively little information is available\(^2\).

Experimentals

Materials Tetrafluoroethylene \(\text{C}_2\text{F}_4\) used is reserved in a cylindrical glass vessel, after purified by fractionation by means of a Podbielniak-type distillation apparatus. The measurement of infrared absorption on the gas was carried out in this laboratory\(^3\). Acetylene gas is prepared with calcium carbide and water, purified through refining reagents and stored in a glass bulb at an atmospheric pressure (purity: 99.4~99.6%). Oxygen is used from a commercial bomb (purity: 99.4%). Air is used after being passed through two wash-bottles containing conc. aqueous solution of potassium hydroxide and conc. sulphuric acid respectively.

Apparatus and procedure The layout of the apparatus is shown in the figure below. Combustibles and oxygen or air are mixed in the glass reservoir \(B_1\), the partial pressures of these gases being measured by the mercury manometer \(M_1\), and reserved more than twelve hours to complete the mixing. Then making use of Toeppler pump \(P\), we transfer them into the glass reservoir \(B_2\) until a definite pressure is attained. The glass reaction vessel having a fine tube \(H\) for the insertion of a thermocouple is evacuated to about 10^{-5} \text{mmHg} pressure and heated by the electric furnace \(F\) to a definite temperature which is measured by an alumel-chromel thermocouple \(T\) inserted.

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* S. Kusuhara is in the postgraduate course, under the direction of Prof. R. Kiyama.
3) R. Kiyama, M. Minomura and K. Osawa, This Journal, 25, 64 (1955)
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The apparatus records on a rotating drum the deflection, being magnified by a lever, of the membrane due to a pressure change.

* * Throughout this paper, composition will be expressed by percentage of combustibles.