Steinheil glass spectrograph of high dispersion. The apparatus (Fig. 2) consisted of a liter flask with a quartz window, connected with a gage and vacuum pump, and surrounded by 6 coils of wire from a 25,000-volt transformer and a condenser of 0.02 microfarads capacity. This stores about 1 calorie of energy at 25,000 volts. The benzene is dried with great care before it is put into the apparatus, and its vapor passes through a tube (D) of phosphorus pentoxide just before it enters the flask.

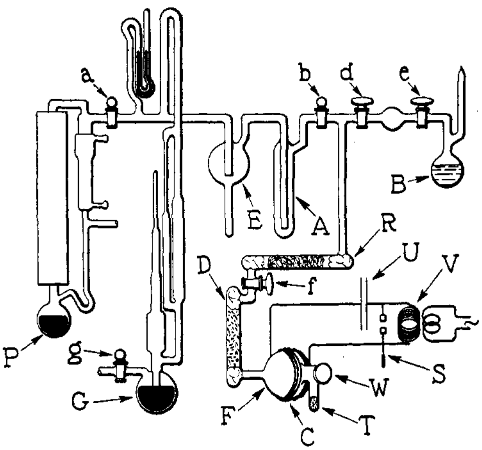

Fig. 2.—Apparatus for the decomposition of organic vapors.

The frequency of the discharge was 1000 kilocycles per second. The pressure at which the discharge acts rises with increasing distance between the terminals of the spark gap. Thus with a 1.5-mm. spark gap the maximum pressure is 0.05 mm., while with a gap of 6 mm. the maximum pressure is 0.25 mm.

In so far as the spectra found are excited by electronic collisions, the velocities of the electrons range between 1.9 and 3.6 volts or between 0.85×10^8 and 1.14×10^8 cm. per second. The limits probably extend farther in each direction. The intermediate products in the decomposition of other organic compounds, such as methane, acetylene, phenol, etc., will be determined, since the spectroscopic method is one of great convenience and usefulness.

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RECEIVED MAY 2, 1930
PUBLISHED JUNE 6, 1930

THE HEAT OF FORMATION OF MOLECULAR OXYGEN

Sir:

The reported values for the heat of formation of molecular oxygen range from 162,000 to 110,000 calories. These values have all been determined by indirect methods. A direct determination of the heat of formation of molecular oxygen has now been obtained using an apparatus essentially the same as that of Bichowsky and the author[1] for hydrogen. This apparatus employs the method of Weide and Bichowsky[2] for determining the

[1] Bichowsky and Copeland, THIS JOURNAL, **50**, 1315 (1928).

[2] Weide and Bichowsky, *ibid.*, **48**, 2529 (1926).

percentage dissociation of a diatomic gas. Atomic oxygen was produced by means of the electrodeless discharge. The recombination took place on the surface of a calorimeter coated with palladium black. It has been shown that water vapor is necessary for the production or at least for the maintenance of the atomic gas.

In the preliminary experiments reported at this time 16 to 25% dissociation was realized at a distance of 10 cm. from the discharge bulb at pressures of 0.1 to 0.2 mm. of mercury. The validity of the application of Knudsen's formula for the measurement of the percentage dissociation at these pressures has been established experimentally by measuring the rate of flow of oxygen through the orifices at the two limiting pressures and also the rate of flow of hydrogen at one pressure lying between these limits. The heat of formation of molecular oxygen as given by these experiments is 7.2 ($\pm$ 0.2) volts or 165,000 ($\pm$5000) calories per gram molecular weight. It is to be noted that although this value is in good agreement with some of the older values, it is considerably higher than those reported within the last year. As it is quite possible that the presence of metastable atoms is giving too high a value, further experiments are now in progress using different pressures and different lengths of path, under which conditions the average life of a metastable atom should be changed. It is hoped in this manner either to prove the absence of metastable states or at least to be able to correct for their excess energy should they be present.

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RECEIVED MAY 3, 1930
PUBLISHED JUNE 6, 1930

ELECTRO-DEPOSITION OF METALLIC BERYLLIUM

Sir:

We wish to announce that as a result of work carried on for a number of years we have been able to obtain metallic beryllium by the electrolysis of solutions of beryllium salts in various organic and inorganic non-aqueous solvents. Although the solutions of beryllium salts in substituted ammonias give deposits of metal, the most satisfactory solvent is liquid ammonia itself either alone or with the addition of salts or other compounds which lower the vapor tension of the solution and increase the solubility of beryllium salts. Thus the metal has been prepared from solutions which may be electrolyzed at room temperature. The metal obtained by these electrolyses is so pure that it is insoluble in even the strongest acids unless the metal is in contact with a more electro-negative metal such as platinum. Under the microscope the metal is seen to be crystalline.

Hitherto all attempts to dehydrate beryllium salts have yielded basic

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