Evolution of Atomic Oxygen from Platinum Surface Treated Previously with Discharged Oxygen Gas

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Fryburg[1] investigated an enhanced oxidation of platinum by treating a platinum strip with discharged oxygen gas at a temperature of 1000°C. He found that when the temperature of a platinum strip is higher than 800°C, a brown deposit of platinum dioxide appears on the wall of the enclosing glass tube in the immediate vicinity of the heated platinum strip.

After treating platinum surface with discharged oxygen gas, it is found that atomic oxygen evolves from it when heated in vacco.

The main part of the apparatus is shown in Fig. 1. D is a discharge tube. The reaction vessel V contains a platinum ribbon (0.024×0.28×363 mm.) capable of being heated by electric current. Atomic oxygen given off is detected by the change of color of molybdenum trioxide deposited on a glass plate P according to the following equation[2]:

$$3\,MoO_3 + O = Mo_3O_8 + O_2$$

Discharged oxygen gas is made to pass through the reaction vessel at a pressure of 0.1~1 mmHg for 20 min., without heating the platinum ribbon by electric current. Then the discharge being stopped, the

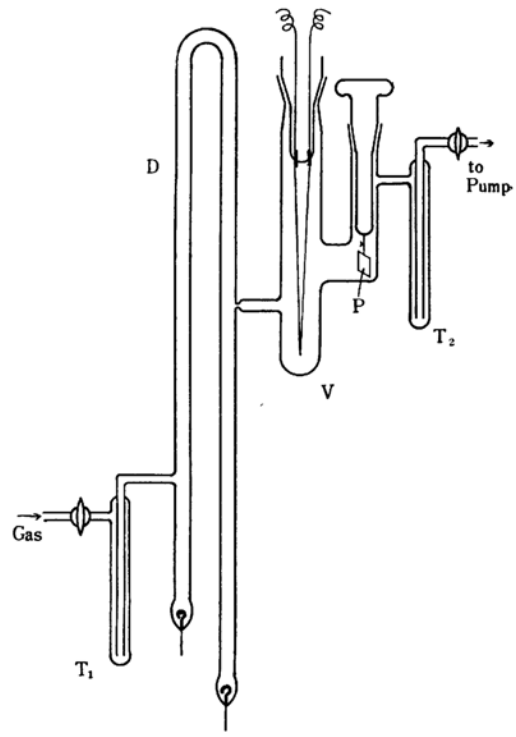

Fig. 1

reaction vessel is evacuated by a diffusion pump through a trap cooled by dry ice. In this condition, molybdenum trioxide remains to be pale yellow. While the evacuation is continued, the platinum ribbon is heated to 1400°C. Then, molybdenum trioxide in the side tube changes its color distinctly from pale yellow to deep blue within 20 min. This is an evidence that atomic oxygen is given off from the platinum surface. The authors will report in a later paper that adsorbed oxygen atoms desorb in molecular form when heated in vacuo. Therefore, taking account of Fryburg's experement[3], it is believed that the platinum surface covered with platinum dioxide, and that atomic oxygen is given off by the decomposition of platinum dioxide when the ribbon is heated to a high temperature in vacuo.

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1) G. C. Fryburg, *J. Chem. Phys.*, **24**, 175 (1956).
2) W. H. Rodebush and W. A. Nichols, *J. Am. Chem. Soc.*, **52**, 3864 (1930).
3) Loc. cit.