

LX.—*Thiophosphoryl Fluoride.*

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(Preliminary Notice.)

WHEN phosphorus pentasulphide is heated with lead fluoride, best in a leaden tube, a gas is formed, which analysis shows to be thiophosphoryl fluoride, PSF_3 . Bismuth fluoride heated with phosphorus pentasulphide forms the same gas, but a higher temperature is required to bring about the reaction. We have also been able to prepare the new gas by heating a mixture of sulphur, phosphorus, and fluoride of lead, using a considerable quantity of the last-named substance; the excess serving to moderate the otherwise violent reaction. An additional mode of formation consists in heating a mixture of arsenic trifluoride and thiophosphoryl chloride in a sealed tube at a temperature of 150° ; but the most convenient method of preparation, and the one giving the gas in a state of purity, is that first described.

Thiophosphoryl fluoride is a transparent, colourless gas, which may be liquefied in the Cailletet apparatus. In contact with the air, the gas, if pure, spontaneously ignites, burning, if it be issuing from a jet, with a pale, yellowish-green flame, tipped with blue. If the experiment be so arranged that a considerable quantity of the gas is brought in contact with the air, it ignites as before, but produces in

the first instance a beautiful blue flash of light, subsequently followed by the yellowish-green flame easily observed in the case of the jet of gas. Thiophosphoryl fluoride is dissolved by water, but not very rapidly. It has no action on mercury. Under the action of heat or the electric spark it is decomposed with comparative ease, sulphur separating in the first instance. If a quantity of the gas be heated in a glass tube over mercury for some time, the volume alters, phosphorus and sulphur are deposited on the sides of the tube, and the resulting gas consists entirely of silicon tetrafluoride. This reaction may be taken advantage of in order to determine the amount of fluorine in the compound. Observations of its spectrum show that the gas is dissociated at the lowest temperature of the spark. Thiophosphoryl fluoride is soluble to some extent in ether, insoluble in alcohol and benzene. It is completely absorbed by peroxide of lead, and unites with ammonia to form a white solid. Passed over heated sodium, the metal takes fire and burns with a red flame, the residual mass giving off spontaneously inflammable phosphuretted hydrogen on treatment with water.

We reserve the details of our study of the properties of this gas for a communication which we hope to lay before the Society at an early date.
