XXX.—*On Phosphide of Magnesium.*

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(Abstract.)

THE author has confirmed his former observations upon the properties of phosphide of magnesium.* Phosphorus vapour does not attack magnesium at a dull red heat, unless the metal is in a finely divided state, and then only with difficulty. In a current of carbonic acid and phosphorus vapour, the carbonic acid acts upon the magnesium at a lower temperature than the phosphorus vapour, and the whole of the magnesium filings may be easily oxidized, with simultaneous deposition of carbon, by simply keeping the heat below that required for the phosphorus vapour to attack it.

Magnesium filings mixed with an equal weight of amorphous phosphorus in coarse fragments, and quickly heated to redness in a long narrow-necked bulb-tube, burn vividly, and yield a uniform well fused phosphide resembling a clinker, very difficultly fusible, very hard and brittle. When freshly fractured, it is of a bright steel-grey colour and lustre, but tarnishes rapidly in the air, and falls first to a brown powder, afterwards to a permanent greyish-white bulky powder, consisting only of magnesia, with a trace of hypophosphite or phosphite, and products of corrosion of the glass tube. In a closed tube it is infusible, and sustains a red heat without alteration; and in an open tube, it is but slowly oxidized, and only on the surface. It decomposes water, with brisk evolution of phosphoretted hydrogen and separation of magnesia. The same decomposition takes place slowly on exposing the phosphide to moist air—dry air has very little action upon it. Hydrochloric acid dissolves it with brisk effervescence, and evolution of phosphoretted hydrogen. Dilute nitric acid decomposes it with violence. Dry hydrogen has no action upon it.

The phosphide was analysed by passing a slow current of moist air over it, and collecting the evolved phosphoretted hydrogen in a solution of nitrate of silver. The oxidized product was first heated with water, then with dilute hydrochloric acid, and filtered from a little silicious residue (resulting from the action of the ignited magnesium on the glass tube). The

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* See page 126 of this volume.

acid solution acidified with nitric acid, was heated for some time; then diluted with water, mixed with chloride of ammonium and excess of ammonia, stirred, and set aside in order to determine whether any precipitate was formed; only a trace was however obtained, proving that no phosphate of magnesia had been formed in the combustion, or in the oxidation of the phosphide. Finally the magnesium was precipitated by phosphate of soda, collected, washed, dried, ignited, and weighed.

The precipitate formed in the nitrate of silver solution, was acidified with nitric acid, and heated gently below 180° Fahr., until entirely dissolved, and the silver was precipitated as chloride by hydrochloric acid. The filtrate mixed with more nitric acid was heated for some time; and the phosphorus was determined in the usual way, by precipitation with ammonia and sulphate of magnesia.

The percentage results show an excess of magnesium due to some magnesium being dissolved out of the silicide of magnesium formed in the combustion.

The following results, however, give the formula for this very unstable phosphide as PMg_3, the same as the so-called black stable phosphide, described by Mr. Blunt,* was said to contain:—

	Experiment.			
	I.	II.	III.	Theory.
Magnesium	54·38	54·61	53·46	52·94
Phosphorus	45·62	45·39	46·54	47·06
	100·00	100·00	100·00	100·00