BY METALLIC CALCIUM.

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DISCUSSION.

Mr. F. E. Weston, referring to the difficulty of reducing silica with aluminium, said that by using silica in the form of kieselguhr and heating the mixture in a muffle furnace at about 500°C ., then starting the reaction with a fuse of Mg ribbon and a little Mg powder, he had succeeded in making silicon, the reduction taking place smoothly and with ease. He had recently used aluminium for the reduction of rutil, producing titanium and silicon. The aluminium used was the finest powder obtainable. He asked the author whether calcium could be obtained in the form of powder.

Dr. H. Borns : I do not wish to raise any priority questions, but I should like to ask Dr. Perkin whether similar experiments were not tried about ten years ago—by Storkern, I fancy—when the same difficulties were experienced owing to the violence of the reactions? *Addendum*—I find that I was mistaken. While experimenting on reductions by means of calcium carbide F. von Kügelgen noticed in 1901 that the calcium seemed to be the reducing agent, but the experiments with metallic calcium and the metallurgical applications of calcium in refining steel (*e.g.*, by Poulenc Frères, alloy of 95 Ca with 5 Al) are of a later date. It was the electrolysis of fused calcium chloride which was successfully accomplished by Rathenau and Suter ten years ago.

Mr. W. Pollard Digby asked whether calcium, like aluminium, had been used in the pouring of steel to prevent segregation, and if so were the results encouraging?

Mr. W. Murray Morrison thought that Goldschmidt probably used some different mixture when reducing silica with aluminium. Had the author, in his experiments in the production of boron by means of calcium, used an excess of boron trioxide in order to try and get pure boron?

The Chairman said he was much interested in Mr. Weston's remarks about kieselguhr, and they confirmed the view that state of division in these experiments was of paramount importance. There was an essential difference between aluminium and calcium as a reducing agent which accounted for the latter being much more violent in its action, notwithstanding that the heats of combination of aluminium and calcium with oxygen were almost the same. Forty parts of calcium required only sixteen of oxygen, whilst fifty-four parts of aluminium combined with forty-eight parts of oxygen, and the resultant heat was for that reason more intense although the actual quantity developed was not greater. The combustion took place more rapidly in the case of the calcium, as it was more quickly supplied with the required amount of oxygen. He did not think that mixing the lining of the crucibles with one of the products of the reaction was an ideal device.

In answer to Mr. Digby, calcium had been used in steel, but there appeared to be no information available as to what extent this was successful. The calcium oxide formed seemed to remain in the steel and give trouble.

Dr. Perkin (*in reply*) said that he was much interested in hearing how successful Mr. Weston had been in causing reaction to take place between aluminium and kieselguhr. There seemed one drawback to the use of kieselguhr, and that was owing to its being such an extremely fine and light powder, and therefore to produce any quantity of silicon very large crucibles would be necessary. Calcium could not at present be obtained in the form of a powder. With reference to Mr. Morrison's query, he had employed excess of boric oxide, but even then had not been successful in obtaining calcium-free boron. It would appear, although there is not much information to be obtained on the subject, that the chief disadvantage in employing calcium in place of aluminium for removing traces of oxide in casting is due to the infusibility of the oxide and also because calcium is said not to alloy with iron.