DISCUSSION.

Professor F. G. Donnan said it was a source of mystery to him what Lorenz meant by "his oxide theory." He thought the theory of reversible oxide depolarisers had long been familiar to every physical chemist, and had in particular been clearly expounded by Haber. The results obtained by Professor Lorenz and Dr. Spielmann were exceedingly interesting, but he could not see where any "new" oxide theory came in.

Concerning the relative advantages of the "discharge" method as compared with the method ordinarily employed, he did not feel at all certain that the former method was superior to the latter.

Dr. G. Senter said that he, like the previous speaker, was also under the impression that the ascription of the abnormalities of the oxygen electrode to the formation of oxides of platinum was earlier than any of the references given by Dr. Spielmann. The matter was, however, by no means cleared up. Bose's experiments, in which platinum electrodes were saturated with hydrogen and oxygen respectively, and the potential difference on discharge measured, had not been referred to by the author; he wished to ask how the results of Bose fitted in with the observations just described.

He himself showed two or three years' ago (*Trans. Faraday Society*, 1906, II., p. 141), that platinum was dissolved at the anode by the oxygen set free from sulphuric acid by exceedingly small currents of the order 10^{-7} amperes per sq. cm., and at the same time an oxidising agent was formed in the solution. It is by no means improbable, as other observers had also suggested, that these phenomena have a bearing on the potential of an oxygen electrode, but it was found difficult to obtain any definite evidence on this matter.

Dr. Charles J. J. Fox said it was well known that an oxidising substance was produced in the neighbourhood of the oxygen electrode. Did the author know the nature of this? As platinum appears to be so readily oxidisable, it is not improbable that the oxidising substance is some platinum compound—some sort of peroxide presumably—and it would be interesting to know what light, if any, is cast by the present work upon the possible existence and composition of such a substance.

The **Chairman** remarked that it should not be forgotten that in such gas cells there are two possible effects to be considered, though somewhat difficult to differentiate—namely, the chemical combination of the platinum with the oxygen, and the physical occlusion of the gas by the metal. The results obtained by Mond, Ramsay, and Shields (*Phil. Trans.*, A. 186, 675, and 190, 129), pointed to the intricate nature of the problems discussed in the paper.

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Dr. P. E. Spielmann, in reply, said it was true that other writers about the same time tentatively suggested the probability of the existence of an oxide on the surface of the Pt anode in the $O_2 - H_2$ gas cell ; but Professor Lorenz was the first to work out the subject systematically, and to show that, under the majority of conditions, oxide was actually and visibly formed ; therefore he spoke of his "Oxyd-Theorie." The compensation method of measurement is only trustworthy when the substance under examination is absolutely pure, or when any existing impurity has a potential lower than that of the substance being measured. Any such impurity, especially when existing in exceedingly small quantity, would be destroyed during the first moments of the passage of current from the cell during the discharge experiment, and therefore the potential measured would be that of the pure substance.

Bose was not measuring the $O_2 - H_2$ cell as he thought, since his method of saturating the electrodes was that employed by Lauber to "form" his Pt plates—*i.e.*, to produce, deliberately, oxides on the Pt surface. The conditions under which Bose worked simply produced an oxide (or mixture of oxides) having the potential obtained. It is quite likely that changes in the electrolyte exert an influence on the potential of an oxygen electrode ; but considering how definite and vigorous were the observations made during the working out of the "Oxyd-Theorie," that influence would be either small or overpowered.

It is conceivable that the Pt, when oxidised to the PtO stage, would dissolve as a platinous compound exerting the oxidising action indicated on page 97 ; but whether it could be held responsible, directly or indirectly, for the changes observed in the electrolyte and on the surface of the platinum, cannot be said at the present time.

Nor is it possible to say anything satisfactory on the connection or otherwise, between the occlusion of oxygen by Pt, and the chemical combination between the two substances. Occlusion might be looked on as a solid solution preparatory to combination, but there are obvious difficulties in the way of even this simple possibility.