X-ray Spectra of the *L*-series of Silicon and Silica

In a preceding letter[1] we have shown that the *K*- and the *L*-spectra from aluminium in the metallic state are definitely different from those found with the non conducting compound Al_2O_3. Analogous phenomena were found by Siegbahn and Karlsson also in the *K*-series of magnesium with the pure element and magnesium oxide (Mg O) (in publication elsewhere). The metals in these cases give broad bands with a sharp edge towards the shorter wave-lengths, which may be explained as transitions from the levels of the conduction electrons. The widths of the bands correspond fairly well with those calculated from the theory.

As it was of interest to see how the next element, silicon, which is a semi-conductor, behaves in this respect, we have taken spectrograms of the element

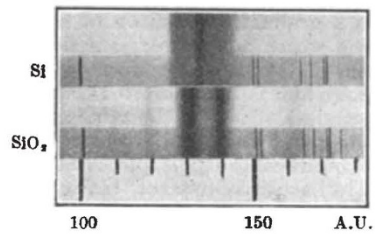

FIG. 1. *L*-Series of Si and SiO_2

and the oxide SiO_2. As is seen from Fig. 1, here also a broad band with a sharp limit towards the shorter wave-lengths is found for the element. In the band two maxima are visible, which are well pronounced and measurable in the photometric registrations. The wave-length of the edge is $125{\cdot}5 \pm 0{\cdot}5$ A., the maxima are at $134{\cdot}3 \pm 0{\cdot}5$ and $138{\cdot}2 \pm 0{\cdot}5$ A. The non-conducting compound, SiO_2, gives a spectrogram of quite another character, with two strong lines at 130·7 A. and 139·5 A. (and a broader, fainter line at 162 A.) as seen in the figure. This corresponds with the spectra of aluminium and the oxide Al_2O_3, where the oxide shows two well-marked maxima instead of the band at the pure metal.

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Dec. 22.

[1] NATURE, 132, **895**, Dec. 9, 1933.

Speed of 'Uniform Movement' of Flame in Mixtures of Carbon Monoxide and Oxygen

In the year 1931[1] Prof. W. A. Bone and Mr. R. P. Fraser published figures for the speed of the 'uniform movement' of flame in moist (stated to be 'saturated' at 12°–13°) mixtures of carbon monoxide and oxygen. Their values are represented by the crosses in the accompanying diagram (Fig. 1). In a paper published in 1932[2] we challenged both the absolute and the relative correctness of those values. Our results, for mixtures saturated at 13·1°, are indicated by circles in the diagram. Prof. Bone and Mr. J. Bell have repeated the experiments[3] and, whilst unable to confirm the earlier determinations, have obtained some (for mixtures saturated at 15°) that correspond with ours, within the limits of reasonable experimental error, as is shown by their curve reproduced in the diagram.

There remains, however, an outstanding difference. Prof. Bone and his colleagues consider that the maximum speed of 'uniform movement of flame in moist mixtures of carbon monoxide and oxygen is obtained with a mixture of the composition

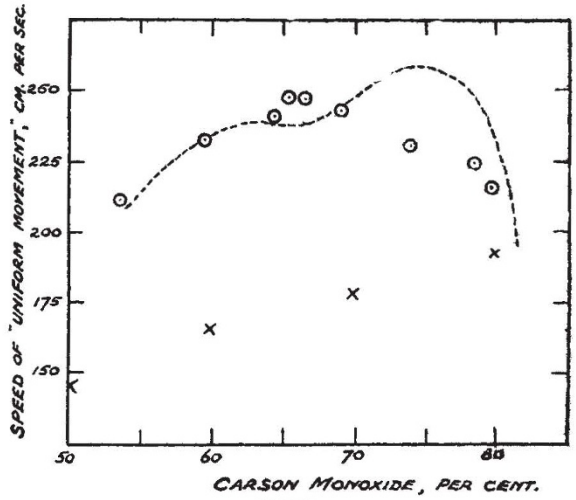

FIG. 1.

$3CO + O_2$, whereas our results show that it is obtained with the mixture $2CO + O_2$. We do not offer any explanation for this difference, but suggest that a third party, sufficiently interested in the problem, should reinvestigate it.

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[1] *Proc. Roy. Soc.*, p. 542, 1931.
[2] *J. Chem. Soc.*, p. 1835; 1932.
[3] *Proc. Roy. Soc.*, **143**A, 1; 1933.

SEEING that on p. 1836 of their paper, (*loc. cit*) Dr. Payman and Prof. Wheeler rightly stressed the fact that "with moist carbonic oxide the speed of flame varies considerably with the concentration of water vapour and is therefore subject to alteration from day to day if the temperature of saturation alters", it is curious to find them now citing an alleged 'correspondence' between some of two sets of flame-speed measurements for moist $CO - O_2$ media saturated at 13·1° and 15·0° (water vapour = 11·3 and 12·75 mm.), respectively, as confirming the former. For when the difference between the two saturation temperatures is allowed for, the seeming 'correspondence' vanishes

In repeating the earlier Bone and Fraser determinations—which, however, were for media containing 10·9 mm. only of water vapour—Mr. Bell and I discovered, what had not been recognised before, the importance not only of accurately controlling the hygroscopic condition of the moist $CO - O_2$ media, but also of ensuring a sufficiently large difference (at least 10°) between their saturation temperature and the temperature of the walls of the tube in which they are inflamed; and having taken special precautions to ensure this most necessary condition, we consider our results more reliable than any previous ones.