

### Combustion of Rigidly Dried Carbonic Oxide-Oxygen Mixtures.

THE paragraph in NATURE of April 13, p. 584, referring to my paper on "The Combustion of Well-dried Carbon Monoxide and Oxygen Mixtures" in last month's *Proceedings of the Royal Society*, contains a statement which, if allowed to pass uncorrected, might convey a wrong impression.

It is scarcely true to say that our previous experiments on the combustion of six-months phosphoric anhydride dried mixtures of carbonic oxide and oxygen had been criticised "on the grounds that inadequate precautions had been taken to remove occluded hydrogen from the platinum electrodes between which the igniting spark was passed," although it may be that in NATURE of Sept. 24, 1927, Prof. H. E. Armstrong had queried whether possibly "hydrogen, imprisoned in the platinum electrodes" had been "extruded into the gas."

In describing, in my recent paper, our further experiments—the object of which was to test whether a prolongation of the phosphoric anhydride drying up to 550, 750, or even 1000 days (instead of the former 170-220 days) would make any difference to the results—I was careful to explain (1) that, in all the previous experiments, the electrodes had been 'glowed out' repeatedly in a high vacuum for many hours (at least 20 in all), so as to remove occluded hydrogen from them, and (2) that, in the further ones, the additional precaution had been taken of electrically 'glowing out' the electrodes in oxygen at low pressure, as well as in a high vacuum, both of which operations were continued many hours.

I do not think there can be any reasonable doubt of the adequacy of the measures taken in the previous experiments to remove occluded hydrogen from the platinum electrodes; in the later ones, the further precaution referred to was taken merely 'to make assurance doubly sure'; and, seeing that the results of the two series did not differ in any material respect, the adequacy of all precautions in both is assured. Indeed, the fact that in both series condenser discharge sparks of anything up to 0.5 microfarad at 1000 volts were repeatedly passed (between platinum-balled electrodes) through the phosphoric anhydride-dried medium, without even the faintest sign of ignition being discernible photographically, may be regarded as a conclusive test, not only of its extreme dryness, but also of the total exclusion of hydrogen from it.

The experimental results now enable us to say quite definitely (1) that a highly purified  $2CO + O_2$  mixture which, under all necessary precautions, has been rigidly dried to the utmost limit possible with re-distilled and highly purified phosphoric anhydride, will still explode and propagate flame provided that a sufficiently powerful igniting spark is used, and (2) that with platinum-balled electrodes the minimum condenser discharge spark required is about 0.75 microfarad at 1000 volts (energy = about 0.75 Joule).

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### Titanium Oxide Bands in the Orange, Red, and Infra-Red Region.

BANDS in the region of  $\lambda 5600$  to  $\lambda 8000$  have been analysed into at least two systems, distinct from that of the blue-green region, previously analysed by Birge and Christy (*Phys. Rev.*, vol. 29, p. 212; 1927. Abstract. NATURE, vol. 122, p. 205; 1928). One of these in the orange is a singlet system due to the

electronic transition  $^1P - ^1S$ , the other a triplet system in the red and infra-red due to the transition  $^3S - ^3P$ . Of the former only one sequence has yet been found; of the latter, four have been determined, namely, the (0, 1), (0, 0), (1, 0) and (2, 0), the  $\Delta\nu$  separations of the triplet heads of the (0, 0) sequence being 66.7 and 74.6  $\text{cm}^{-1}$  respectively.

The molecular constants, determined from the vibrational analysis of the triplet system, show that in the final state the vibrational frequency of the rotationless molecule with infinitesimal amplitude of vibration is the same as in the blue-green system, and that thus their final energy level,  $^3P$ , is the same. Further, since the separation of the triplets of red-infra-red system pertains to this final level, it pertains also to the final level of the blue-green system.

Analysis of the other bands found in the red is in progress.

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### Ozone Absorption during Long Arctic Night.

I HAVE been trying for the past ten years to interest the astronomers in having photographs of stellar spectra made during the long arctic or antarctic night, on the chance that the ultra-violet cut off due to ozone may be less powerful, and I mentioned it to Prof. Russell last spring. I have always emphasised the importance of choosing a station so situated that there will be a minimum chance that ozone formed in the illuminated regions will be carried over into the dark region by atmospheric circulation. Information regarding the direction and velocity of the upper atmospheric current will be necessary in choosing the site. It should certainly be nearer the pole than the station occupied by Prof. Rosseland (NATURE, Feb. 9, p. 207), for the sun at noon was only three or four degrees below the horizon, and the air five miles above the surface was in full sunlight, as Prof. Russell pointed out to me. His negative result I do not regard as decisive, though I am not very hopeful that much or any extension of the spectrum will be found, as ozone is fairly stable. An objective prism pointed at the pole star seems the simplest device.

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### Lengthened Chain Compounds of Sulphur with Platinum.

IN NATURE (Jan. 22, 1927, p. 124) a lengthened chain compound of sulphur of the formula  $\text{BrC}_2\text{H}_4(\text{SC}_2\text{H}_4)_{18}\text{Br}$ , as also another of sulphonium sulphur having so high a molecular weight as 3472, have been described.

Recently, in collaboration with K. C. Bose-Ráy, I have prepared another series of complex sulphur-platinum chain compounds (*Zeit. anorg. Chem.*, Bd. 178, p. 329; 1929) the first member of which has the formula  $\text{Pt}_3\text{Cl}$ ,  $2(\text{C}_2\text{H}_5)_2\text{S}_2$ ,  $2\text{NH}_3$ ,  $6\text{H}_2\text{O}$ , and the last  $\text{Pt}_{13}\text{Cl}$ ,  $10(\text{C}_2\text{H}_5)_2\text{S}_2$ ,  $2\text{C}_2\text{H}_5\text{NH}_2$ ,  $8\text{H}_2\text{O}$ , with a molecular weight as high as 4050.5. This is perhaps the only example as yet known of a metallic compound synthesised in the laboratory and possessing such a high molecular weight.

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