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## ON THE ABSORPTION-SPECTRUM, AND THE COLOUR OF LIQUID OXYGEN. BY K. OLSZEWSKI.

In an earlier research the author found four absorption-bands in the spectrum of liquid oxygen corresponding to the wave-lengths 628, 577, 535, and 480. Liveing and Dewar (*Phil. Mag.* [5] vol. xxvi. p. 286), who observed the absorption-spectrum of gaseous oxygen in a long steel tube under high pressure, found the same four absorptions in the visible part of the spectrum, and moreover in the extreme red the bands corresponding to the Fraunhofer lines A and B, which have also been observed by Egeroff and Janssen. An apparatus recently constructed by the author for liquefying a large quantity of oxygen enabled him to repeat his former experiments, and to examine more closely the absorption-spectrum of a thicker layer of liquid oxygen in the extreme red.

The liquid oxygen was poured from the generating vessel into a thin glass tube closed at the bottom, which as a protection against external warmth was closely fitted in a set of three beakers. The thickness of the column of oxygen was 30 millim., and its height about 50 millim. The liquid oxygen maintained itself for half an hour under the pressure of the atmosphere, and at its boiling-point ( $-181^{\circ}4$ ) in a sufficient quantity for making the experiment, although a considerable quantity of heat was imparted to it, especially by the limelight concentrated by a condensing lens, which the author used for preparing the absorption-spectrum. A universal spectroscope by Krüss, with a Rutherford's prism, was used for investigating the absorption-spectrum. Besides the four absorptions already observed the experiments gave a fifth shadowy band, corresponding to the Fraunhofer line A, which was especially distinct when a red glass was interposed between the source of light and the slit of the spectroscope. This band appeared feebler than the three absorptions corresponding to the wave-lengths 628, 577, and 480, but stronger than the absorption 535. With this comparatively small dispersion the band A could not, of course, be resolved into lines. An absorption corresponding to Fraunhofer's line B could not also this time be observed.

Liquid oxygen has been described as a colourless body on the basis of the experiments made in 1883, in which only small quantities could be obtained. Since then the author has observed that whenever oxygen was liquefied in rather wide glass tubes, it showed in incident light in layers of about 15 millim. a bluish colour. In the experiments described above, in which for the first time a relatively large quantity of liquid oxygen was collected in a glass vessel, its bright blue colour was decidedly apparent. In order to be certain that the oxygen prepared from chlorate of potassium and manganese did not contain traces of ozone from which the colour might arise, it was carefully tested in this direction. Iodide of potassium and starch-paper was not coloured when kept

in the oxygen tested. Even when the gas was passed for some time through a solution of iodide of potassium and starch no blue colour was perceived. The oxygen used for the experiment remained for a week in the iron reservoir into which it was pumped in contact with solid potassic hydrate, by which it was completely freed from  $\text{CO}_2$ , from chlorine, and from aqueous vapour.

From these experiments there can be no doubt that oxygen in the liquid condition, and in layers of about 30 millim., has a decidedly bright blue colour. This colour of oxygen agrees very well with its absorption-spectrum. It was surprising that a colourless liquid, such as oxygen was supposed to be, had such a pronounced absorption-spectrum, in which the absorptions predominate in orange, in yellow, and in red. But this apparent contradiction has been removed by the above experiments of the author.

One word in conclusion as to the colour of the sky. There are, as it is known, so many hypotheses which attempt to explain this that the author scarcely dares to propound another. But in his opinion this phenomenon would be most readily explained by ascribing the blue colour of the sky to this constituent of the atmosphere, which has a blue colour, at any rate in the liquid state.—Wiedemann's *Annalen*, xlii. p. 663.

ON A PECULIAR CASE IN THE REFRACTION OF ORGANIC COMPOUNDS. BY R. NASINI AND T. COSTA.

The authors have found a compound formed by the simple union of two others, which, instead of having a molecular refraction double the sum of those of the components, has a far greater one. This compound is the iodide of triethylsulphine, the components being iodide and sulphide of ethyl. The constants are for the compound V, and for the mixture of both, G, 5.085 gr. of each dissolved in 100 cubic centim.

	$d_4^{20}$ .	$\mu_{\text{H}_\alpha}$ .	$\frac{\mu_{\text{H}_\alpha}^{2-1}}{d}$ .	$\frac{\mu_{\text{H}_\alpha}^{2+2}}{(\text{H}_\alpha^{2-1})d}$ .
V . . . .	0.81761	1.36857	0.45079	0.27568
G . . . .	0.81076	1.36414	0.44926	0.27509

The sulphur has therefore a far greater atomic refraction in the compound than in the mixture. It might be supposed that this arises from the fact that the sulphur in the compound is  $\text{S}^{\text{IV}}$  and in the sulphide  $\text{S}^{\text{II}}$ ; but this would not agree with the deportment of oxygen compounds in sulphur.—*Rend. R. Acc. dei Linc.* vi. pp. 259–263 (1890); *Beiblätter der Physik*, No. 2, 1891.