DENSITY OF LIQUID OXYGEN.¹

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By M. RAOUL PICTET.
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“You arrive at the expression of the density of liquid oxygen as being represented by $\frac{1}{18} = 1 = \delta$ in the solid state, and probably the liquid one also, neglecting the variation due to expansion.

“I have the great satisfaction of being able to announce to you the complete experimental demonstration of the theoretical views enunciated by you now some time ago at Geneva. This demonstration has been arrived at as follows:—

“I know directly and very exactly—

“I. The exact volume of the interior of the wrought iron shell and the volume of potassic chlorate decomposed into oxygen and potassic chloride.

“II. The temperature of the shell at the moment of complete decomposition.

“III. The volume of the tube in which the condensation of oxygen is brought about.

“IV. The pressure before and after condensation.

“V. The pressures indicated by the manometer after two or three successive jets, till the moment the point of saturation is reached, and after which the gas issues in a gaseous form.

“These various data, combined with the gaseous density pressure and temperature, lead me to the conclusion that a difference of 74·26 atmospheres on the manometer represents the variation of pressure corresponding to the condensation of oxygen in the tube immersed in the carbonic acid.

“This variation has been exactly observed in the last three experiments which I have made with the assistance of many of my colleagues here at Geneva.

“The quantity of liquid oxygen which we had in the tube was 45·467 grammes, corresponding to a volume of 46·25 cubic centimetres. But it is possible that the highest part of the thin tube had

¹ Letter to M. Dumas. *Comptes Rendus*, Jan. 7th, 1878.

some centimetres in length not occupied by the liquid. This may explain the difference of 0.8 gramme found.

“Moreover, very volatile liquids have such considerable expansions that it is indispensable to have exactly the temperature to which they are subjected, in order to determine their true density. However this may be, there is an absolute verification, within small limits, of error of the theoretical calculation regarding this physical constant.”

In addition to this important result, in another experiment, M. Pictet has used polarized light to determine the presence or absence of solid particles of oxygen in the jet. The jet was illuminated by means of the electric light, and observed with two Nicol prisms. A very strong polarization was observed, indicating the presence of solid particles, which in all probability were really solid particles of oxygen.

LIQUEFACTION OF HYDROGEN.¹

By M. RAOUL PICTET.

“*Geneva, January 11th.*

“I have the pleasure of giving you the result of an experiment carried out by me on the evening of Thursday, the 9th inst., with a view to liquefy and solidify hydrogen.

“This apparatus was exactly the same as that for the liquefaction of oxygen. I made use of nitrous oxide instead of carbonic acid.

“To obtain hydrogen under pressure, I decomposed formiate of potash with caustic potash. The hydrogen is given off without a trace of water, and the residuum is not volatile, two conditions essential to obtaining exact observations. The reaction has a well-defined temperature, above which it did not rise, the hydrogen being given off with perfect regularity, at a rate corresponding to 252 litres at zero. The pressure rose to 650 atmospheres before it stood still. The cold was about -140° (I have not yet reduced the measurement of the temperature). On opening the stop-cock, the liquid hydrogen issued with vehemence from the orifice, making a piercing, whistling sound. The jet was of a steel-blue color, and was com-

¹ Letter to M. Dumas. *Comptes Rendus*, Jan. 14th, 1878.