

Citation:

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course of the plaitpoint elements, I shall give here the results of a computation which I have executed for CO_2 and H_2 .

$x = 0$ (pure CO_2)	$T_{xpl} = 304,1$	$p_{xpl} = 72,9$
0,1	295,8	90,8
0,2	287,4	108,7
0,3	274,8	124,8
0,4	260,4	140,0
0,5	244,3	153,9
0,6	222,1	162,9
0,7	194,0	164,5
0,8	157,0	152,5
0,9	108,8	115,2
$x = 1$ (pure H_2)	38,5	20

The course of the plaitpoint line resulting from this agrees with fig. 9, plate I of HARTMAN'S Thesis for the doctorate; in reality, however, the maximum of the plaitpoint pressure will lie much higher.

Physics. — “*Appendix to Communication N^o. 81*”. (Proceedings June 28 and September 27, 1902) and Supplement N^o. 7 (Proceedings Oct. 31, 1903). By Dr. J. E. VERSCHAFFELT. Supplement N^o. 12 to the Communications of the Physical Laboratory at Leiden. (Communicated by Prof. H. KAMERLINGH ONNES).

(Communicated in the meeting of January 27, 1906).

In the expression which I have given before (Comm. N^o. 81 and also Suppl. N^o. 7) for the function ψ in the neighbourhood of the plaitpoint an inaccuracy has remained. I have found that I have neglected therein more than a mere linear function of x .

If we write:

$$\psi = \int_v^V p dv + \psi_V,$$

where V represents a very large volume, then ψ_V is the free energy in the perfect gaseous state, with the exception of an error which will be smaller as V itself becomes larger, and which vanishes when we put $V = \infty$.

The first term of ψ , which depends on v , may be dissolved in the following way:

$$\int_v^V p \, dv = \int_v^{v_{Tk}} p \, dv + \int_{v_{Tk}}^V p \, dv.$$

The first part I have developed before, and $X = \int_{v_{Tk}}^V p \, dv - RT \log V$

($V = \infty$) is the x -function which has then been wrongly left out of account. This function cannot be developed in the same manner as the first integral, because the series used for that is no longer convergent for large volumes; we must therefore turn to KAMERLINGH ONNES' empirical equation of state.

When this equation of state is written in a reduced form, it also represents the reduced equation of the isothermal of the mixture x , at the reduced temperature $t = \frac{T}{T_{xk}}$, so that

$$\begin{aligned} \int_{v_{Tk}}^V p \, dv &= p_{xk} v_{xk} \int_{\frac{v_{Tk}}{v_{xk}}}^{\frac{V}{v_{xk}}} p \, dv = \\ &= RT (\log V - \log v_{Tk}) - \frac{\mathfrak{B}}{\lambda^2} p_{xk} v_{xk}^2 \left(\frac{1}{V} - \frac{1}{v_{Tk}} \right) - \frac{\mathfrak{C}}{\lambda^3} p_{xk} v_{xk}^3 \left(\frac{1}{V^2} - \frac{1}{v_{Tk}^2} \right). \end{aligned}$$

Hence the neglected x -function is:

$$X = -RT \log v_{Tk} + \frac{\mathfrak{B}}{\lambda^2} \frac{p_{xk} v_{xk}^2}{v_{Tk}} + \frac{1}{2} \frac{\mathfrak{C}}{\lambda^3} \frac{p_{xk} v_{xk}^3}{v_{Tk}^2} + \dots$$

and this may be developed again:

$$X = X_0 + X_1 (x - x_{Tk}) + X_2 (x - x_{Tk})^2 + \dots$$

where the co-efficients X_0, X_1, X_2 etc. are still functions of temperature. Fortunately the neglect of that function X has not influenced the results in first approximation; however in the formulae 4, 5, 12 and 13 of suppl. N^o. 7 we have to add $2X_2$ to the factor

$$\frac{RT}{x_k(1-x_k)}$$