deleterious effects which the contact of menstuous women are said to exert upon such things as hams, preserves, bread, wine, and flowers, may be attributable to the action of this substance. Experiments which I have had under way for some time lend strong support to this suggestion

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Temperature Influence on the Pressure Broadening of Spectral Lines

THE classical theories of pressure broadening of spectral lines given by Lorentz¹ and by Weisskopf² lead to the following intensity distribution in an absorption line:

$$K_{\omega} = \text{Const.} \frac{\gamma}{(\omega - \omega_0)^2 + \gamma^2/4} \quad (1)$$

subject to the condition $\omega \gg \gamma/2$. Here $\gamma/2$ is the number of collisions per second of the absorbing atoms with the perturbing ones, K_{ω} the absorption coefficient for frequency ω , and ω_0 the frequency corresponding to the centre of the line. If the concentrations of absorbing and perturbing atoms are constant, Lorentz's theory predicts $\gamma \sim \sqrt{T}$, where T is the absolute temperature of the gas. Taking into account Weisskopf's relation between impact diameter and relative speed of colliding atoms, we find $\gamma \sim T^{3/10}$. Under special conditions, relation (1) follows as a limiting distribution from the wave-mechanical theory given by one of us^{3,4}. In this theory, the width of spectral lines does not depend directly upon the number of collisions per second, although it does depend upon the kinetic energy of colliding atoms and upon the shape of potential curves.

So far as we know, Orthmann⁵ was the only one who investigated the dependence of line broadening upon temperature at constant concentration of absorbing mercury atoms as well as of perturbing hydrogen molecules. His results agreed with the theory of Lorentz. We have investigated the broadening of the Hg absorption line 2537 Å. caused by helium at the concentration of 8.8×10^{14} mercury atoms and 1.24×10^{19} helium atoms per c.c. The gases were contained in a silica tube 150 cm. long. The absorption spectra were photographed by means of a Hilger quartz spectrograph (dispersion 1.6 Å./mm.). As is well known, the lines broadened by the presence of light gases show a symmetrical intensity distribution similar to that given by the relation (1). It is usually thought now, that in this case the broadening is due mostly to the so-called collision damping effect, which depends upon the temperature; the role of statistical effect, which does not depend upon temperature, should be negligible. The use of a mercury-helium mixture enabled us to vary the gas temperature within very wide limits without changing the atom concentration.

It is well known that the total quantity A of light absorbed from a continuous background (as well as the surface limited by the curve in the accompanying graph) by a line with intensity distribution given by (1) is, *ceteris paribus*, proportional to the square root of the line width:

$$A \sim \gamma^{1/2} \quad (2)$$

when the absorbing layer is sufficiently thick. Lorentz's theory leads in that case to

$$A \sim T^{1/4}; \quad (3)$$

whereas that of Weisskopf leads to

$$A \sim T^{3/20}. \quad (4)$$

We think that our measurements were sufficiently precise to show the effects predicted by the relations (3) and (4). The accompanying graph shows an

Hg ABSORPTION LINE 2537 Å. BROADENED BY HELIUM. BLACKENING OF PHOTOGRAPHIC PLATE AS FUNCTION OF DISTANCE FROM CENTRE OF LINE. + ABSORPTION SPECTRUM AT 398° K.; O ABSORPTION SPECTRUM AT 1195° K. 1 CM. CORRESPONDS TO 0.23 Å.

absorption curve obtained from absorption photographs taken at 398° K. (crosses) and at 1195° K. (circles); the blackenings of continuous background given by the hydrogen discharge tube were reduced to constant intensity. The curves for both these temperatures are seen to be identical within the limits of experimental error (for the lower temperature the surface limited by the curve is about 4 per cent greater than the surface limited by the curve corresponding to the higher temperature; but this difference lies within the limits of experimental error). This result indicates that the broadening of the Hg absorption line 2537 Å. caused by helium does not depend appreciably upon the temperature.

Similar researches upon the influence of other gases upon the mercury line 2537 Å. will be undertaken shortly.

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