The deviation of the values of individual rate constants from the mean is appreciably greater than is usually found where a single mixture can be followed with time, yet no correlation between the deviations and the concentrations of reactants or products is evident.

It must be pointed out that iodine monochloride dissociates[1] somewhat (3% at 210°) into iodine and chlorine, and that a mechanism involving the possible reaction of hydrogen with chlorine must be considered. Inasmuch as the dissociation is greatly repressed as soon as some free iodine is formed, and since mixtures initially containing excess iodine gave sensibly the same results, such a mechanism does not seem likely. The direct reaction between hydrogen and iodine is very slow at 240° and below.[2]

When the average values of the specific reaction rate constants are plotted against $1/T$ a straight line results. The energy of activation for the assumed slow reaction is 33,900 cal.

(1) McMorris and Yost, THIS JOURNAL, **54**, 2247 (1932).
(2) Bodenstein, *Z. physik. Chem.*, **29**, 295 (1899).

CONTRIBUTION FROM
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Specific Heat and Binding Conditions of Adsorbed Argon on Charcoal

BY HANS M. CASSEL

When a monoatomic gas is adsorbed at the surface of an elementary solid, the first adsorption layer represents a more or less perfect continuation of the crystal lattice. Accordingly, the "adatoms"[1] behave as being bound by certain centers of attraction around which they move similarly as the atoms of the adsorbent. But, due to the anisotropy of the situation, the oscillation perpendicular to the surface freezes in, if the temperature is enough decreased, whereas the degrees of freedom parallel to the surface, corresponding to weaker binding forces, remain still excited at much lower temperatures.

It depends on the size and shape of the potential box in which the adatom may be regarded as contained,[2] whether the movement is a two-dimensional translation or a two-dimensional harmonic oscillation. Accordingly, the specific heat of the adatoms, in the first case, has the value, R, remaining constant except at extremely low temperatures, and, in the second case, the value, $2R$, decreasing with decreasing temperature in analogy to the Debye function of the three-dimensional oscillator.

F. Simon and R. C. Swain[3] recently having measured the heat capacity of argon adsorbed on charcoal observed the rather constant value, R, between 80 and 60°K., but, at lower temperatures, a decrease leading to an almost imperceptible amount below 20°K. Thus, the experimental result agrees neither with the first nor with the second possibility explained above. Instead, the appearance of the sloping-down perfectly resembles the Debye function of a one-dimensional oscillator.

This view, indeed, is justified, since it is much more probable that an argon atom is adsorbed in the hollow edges or steps of the very cleavable material than on the smooth surfaces of the netplanes. Adatoms bound by two vicinal crystal planes, at low temperatures, are capable of only one-dimensional vibrations parallel to both surfaces. The specific heat measurements, therefore, back the suggestion that the majority of the argon atoms is adsorbed in this way.

(1) I. Langmuir, *J. Chem. Physics*, **1**, 3 (1933).
(2) The author is very much indebted to Dr. L. Pauling, Cal. Tech., for the calculation of the degeneracy temperature.
(3) F. Simon and R. C. Swain, *Z. physik. Chem.*, **B28**, 189 (1935).

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Areametric Analysis. A Useful Technique in Estimating Small Amounts of Heavy Precipitates

BY V. R. DAMERELL AND M. AXELROD

In attempting to measure small amounts (0.01 to 5 mg.) of lead sulfate in contact with sulfuric acid, the authors were able to develop a simple technique whereby compact circular (or square) piles of precipitate could be obtained, of reproducible dimensions, in the center of the flask bottom (see Fig. 1). The apparent areas of these "spots" (as viewed from above, and assuming them to be flat circles or squares) could be readily measured and compared to the areas produced by known amounts of precipitate. This method of analysis is new, according to the authors' best knowledge, and since it involves the measurement of an area, the term areametric analysis is proposed.

The method is generally applicable to heavy