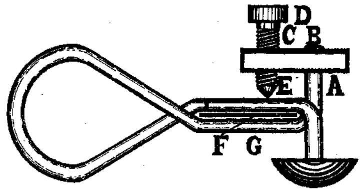
4. The ordinary thermodynamic formula for the electromotive force of a concentration cell with transport ignores the transport of water. If this be taken into account the transport number involved is the true and not the Hittorf number.

5. Emphasis is laid upon the fact that activity measurements give the activity of the unhydrated ion. An increase in the fraction of ions not hydrated gives the simplest explanation of the increase of activity coefficients in concentrated solutions.

AMHERST, MASSACHUSETTS

NOTES

A Screw Modification of the Mohr Pinch Clamp.—Although the use of a Mohr buret is often made imperative in volumetric work, no satisfactory pinch clamp has ever been devised to allow dropwise delivery of solutions from a buret of this type. The accompanying sketch shows the details of a pinch clamp designed to fill this need. It may easily be made from an ordinary Mohr clamp, and has an advantage over a screw clamp in that only one hand is required for its manipulation.



Into a brass plate 3 mm. thick, 1 cm. wide, and 2 cm. long 2 holes, B and C, are drilled and then tapped. The wire A leading up from the jaws of the clamp is threaded, screwed into the plate through B, and then brazed or soldered securely in the position shown in the figure. A large-headed brass screw D is then screwed through C until its pointed end E just touches the top of plate F when the clamp is pressed just hard enough to allow liquid to pass in drops through the rubber tube between plate F and wire G. Of course, by screwing D further it is possible to secure any other desired rate of flow.

DEPARTMENT OF CHEMISTRY
THE RICE INSTITUTE
HOUSTON, TEXAS
WILLIAM M. CRAIG
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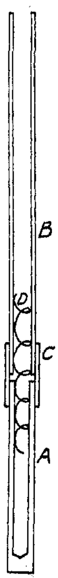
Gas Electrode.—A convenient form of hydrogen or other gas electrode and one which attains the equilibrium value very quickly, may be made as follows. A piece of round graphite rod A of any convenient size (3 mm. diameter was used) is drilled axially to within 6 mm. of the bottom. This is attached to a similar sized copper tube B, for leading in the gas, by a short length of rubber tubing C as shown in the figure. A spiral of light copper or platinum wire D, inserted as shown, ensures electrical contact between the copper and graphite. The outside surface of the graphite is then platinized in the usual manner. When gas at $^1/_4$ to $^1/_2$ of an atmosphere is forced in, it passes very slowly and uniformly through the graphite forming small bubbles over the entire surface, thus very quickly saturating the platinum black and using a minimum quantity of gas. Such an electrode supplied with hydrogen from a cylinder came to the equilibrium value[1] within $1^1/_2$ minutes and remained constant even though the electrode was in an open beaker of acid. This type of electrode is being used at this Laboratory for measurement of the reduction potential of acetylene and ethylene mixtures and is found to come to an equilibrium very much more quickly than a platinized platinum electrode and to require less gas. A glass tube can of course replace the copper tube, and the light spiral wire be carried through a seal further up the tube.



Wilke[2] tried to use a palladium tube as a hydrogen electrode in the same way as the graphite electrode described above, but found the electromotive force was dependent on both the internal and external pressures. This effect was not observed with the graphite electrode; a higher pressure only caused the electromotive force to reach equilibrium sooner. There is an essential difference between the two electrodes; the graphite is actually porous but Wilke believes the hydrogen must *diffuse* through the palladium. There is reason[3] to believe that it is monatomic hydrogen which passes through the electrode in the latter case and there may exist, therefore, on the outer surface of the palladium a slight excess of monatomic hydrogen over its equilibrium concentration. This would cause the electromotive force to be higher and to increase with increase of pressure. In the case of the graphite the diatomic hydrogen passes through and has at the surface a pressure of 1 atmosphere. The platinizing on the surface very materially stabilizes the electromotive force, and the opinion is ventured that if the palladium tube were platinized it would catalyze the formation of diatomic from the excess monatomic hydrogen and give correct values for the electromotive force dependent only on the external pressure.

Rogers Laboratory of Physics
Electrochemical Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts
M. Knobel
Received May 9, 1923

[1] Measured only to 0.1 mv.

[2] Wilke, *Z. Elektrochem.*, **19**, 857 (1913).

[3] See the work of Winkelmann, *Ann. Physik*, **6**, 104 (1901).