

EXTENT OF THE DOUBLE LAYER

The capacity increases as the meniscus is operated nearer the end of the tube, which is contrary to what might be expected. This fact alone suggests that the double layer is not confined to the meniscus.

Lippmann¹ calculated the thickness of the double layer from observations on the surface tension and the corresponding potential difference which give the surface density σ . The thickness of the double layer is then found from $\sigma = \frac{1}{4\pi d}$.

The calculated value is $d = 1.4 (10)^{-7}$ mm. — of *molecular* dimensions. If we calculate the thickness of the double layer from the capacity and the dimensions of the meniscus, we obtain a very much smaller value, *i.e.*, of the order 10^{-12} mm. Then, either the double layer has no such existence, as assumed by Lippmann, or the acid-mercury surface is much greater than the area of the nearly hemispherical meniscus. For example, the capacity of capillary No. 6 was measured in the usual manner and found to be approximately .25 mf. The diameter of the tube was about .035 mm. The area of the meniscus is then approximately $2(10)^{-5}$ sq. cm. Then, either the double layer is only $6.8(10)^{-12}$ cm. thick or its area is 0.039 sq. cm.

This raises the question of the creeping of the acid solution between the glass and mercury. To test this point, a fresh capillary was drawn (No. 11) and operated as follows: The large tube, which tapered below into the capillary, was filled with mercury in the usual manner. Then it was immersed in the acid and the mercury forced to run out under pressure to exclude air. Then the pressure was reduced gradually until the acid entered the tube a distance of only 2.75 mm. and the capacity was measured at a point 2.5 cm. from the end. Next, the acid was allowed to wet the tube for a distance of 3.00 mm. and the capacity again measured at a point 2.5 mm. and so on. The following values of potentials show that the progressive wetting of the tube with acid does not change the capacity.

Amount wet	Capacity in terms of Potentiometer wire
2.75 mm.	4.68
3.00	4.64
3.25	4.75
3.50	4.89
3.75	4.68

¹ Lippmann. Compt. rend. 95, 686, 1882.