THE RATE OF DISSOCIATION OF NITROGEN PER-OXIDE

BY W. L. ARGO

The relation between the pressure, temperature and density of nitrogen peroxide is satisfactorily expressed by the statement that there is equilibrium between two gases with formulae N_2O_4 and NO_2 .¹ Up to the present, no experiments have been made with the object of ascertaining whether any appreciable time is require for establishing equilibrium between these two gases, after an alteration of pressure. The purpose of the present paper is to determine whether in very rapid changes of pressure there is any evidence of "lag" in the reaction.

In his experiments on the rates of reaction of gases, van't Hoff² found that in many cases the walls of the vessel hastened the reaction. To eliminate this factor, and at the same time to obtain the necessary rapidity in the pressure changes, the oscillations of stationary sound waves have been made use of in this research.

If the ehange of dissociation is very rapid there will be equilibrium between the nitrogen tetroxide and dioxide, according to the equation N_2O_4 $2NO_2$, at every instant during the oscillations of the sound waves, and the local density of the gas at each moment will correspond to what would be found by ordinary density measurements for the local pressure and temperature.

If, on the other hand, the rate of reaction is so small that no appreciable changes in dissociation occur, the density at every moment will be that ealculated by the gas law pV = nRT, when *n* is constant.

If the velocity of sound in nitrogen peroxide ean be ealeulated with sufficient accuracy for each of these limiting assumptions, it will be possible, by measurement of sound velocity

¹ Gibbs: Trans. Conn. Acad., 3, 240 (1878).

² Van't Hoff-Cohen: Studien zur chemischen Dynamik, p. 45 (1896).