

# ABSTRACTS OF CHEMICAL PAPERS PUBLISHED IN BRITISH AND FOREIGN JOURNALS.

## General and Physical Chemistry.

**Structural Formulæ.** By J. H. VAN'T HOFF  
(Bull. Soc. Chim. [2], xxiii, 295—301).

LET it be granted that the atoms composing a molecule lie in the same plane, and that the four affinities of an atom of carbon may be represented by four directions situated in this plane and perpendicular between themselves; let this hypothesis be applied to the derivatives of methane obtained by replacing successively the atoms of hydrogen by the univalent groups  $R_1, R_2$ , and the following isomerides can be obtained: One for  $CH_3R_1$  and  $CH(R_1)_3$ ; two for  $CH_2(R_1)_2$ ,  $CH_2(R_1R_2)$  and  $CH(R_1)_2R_2$ ; three for  $CH(R_1R_2R_3)$  and  $C(R_1R_2R_3R_4)$ , a larger number than are known at the present day.

Again, suppose the affinities of the atoms of carbon directed towards the summits of a tetrahedron, the carbon-atom itself occupying the centre, the number of isomerides will be thus reduced to one for  $CH_3R_1$ ,  $CH_2(R_1)_2$ ,  $CH_2(R_1R_2)$ ,  $CH(R_1)_3$ ,  $CH(R_1)_2(R_2)$ , but to two for  $CH(R_1R_2R_3)$  or  $C(R_1R_2R_3R_4)$ ; in other words, when the affinities of an atom of carbon are saturated by four different univalent groups, it is possible to obtain two different tetrahedra, of which one may be considered as the reflected image of the other, and which can never be superposed; they are isomeric.

Starting from this hypothesis, the author proceeds to show that combinations which possess an atom of carbon combined with four different univalent groups, and which he terms an *asymmetric* atom, present anomalies with respect to isomerism, &c., which are not explained by the constitutional formulæ in common use. From observations he has deduced the following rules:—

1. Every organic combination which in solution rotates the plane of a ray of polarised light, contains an atom of asymmetric carbon. The reciprocal of this law, in a large number of cases, does not hold good. This may perhaps be attributed to the presence of two isomerides of opposite rotatory power, or to the fact that asymmetric carbon is not in itself wholly sufficient to account for optical activity, which may depend also on the nature as well as the mutual diversity of the atoms attached to the carbon-atom.

2. Derivatives of optically active combinations lose their rotatory power when the asymmetry of their carbon-atoms disappears. When the contrary happens they do not generally lose it. Thus inactive malonic, fumaric, and maleic acids are derived from active malic acid, inactive succinic acid from active tartaric acid, &c.

A due regard to the foregoing assumptions will often lead to the

rejection of one formula for a certain combination in favour of another; it will tend to assign limits, with some probability, to the field of active combinations, while it explains why certain series, such as the hydrocarbons, the normal primary alcohols and acids, are wholly destitute of rotatory power.

If the asymmetric carbon-atom does not render active a combination into which it enters, it should give rise to an isomeride, and if two asymmetric atoms be present, the number of isomerides should be doubled.

In the case where two carbon-atoms are united by two affinities, the imaginary molecule is supposed to consist of two tetrahedra united by one edge (*arête*). Suppose  $R_1R_2$  and  $R_3R_4$ , the groupings by which the free affinities of the two carbon-atoms are saturated; if  $R_1$  and  $R_2$ , or  $R_3$  and  $R_4$  are identical, only one figure can be constructed, but if at the same time  $R_1$  differs from  $R_2$ , and  $R_3$  from  $R_4$  (which does not prevent  $R_1$  and  $R_3$ ,  $R_2$  and  $R_4$  from being alike), two solid figures can be arranged in which the difference resides in the relative positions of  $R_1$  and  $R_2$  with respect to  $R_3$  and  $R_4$ . The want of resemblance between these figures brings forward a case of isomerism unprovided for by ordinary constitutional formulæ. The author explains in this manner the isomerism of maleic and fumaric acids, bromo- and isobromo-maleic acids, ita- and mesaconic acids, solid and liquid crotonic acid. He rejects the formula  $CH_2.CH.CH_2.COOH$  for liquid crotonic acid upon grounds similar to those advanced by Kekulé, and explains the isomerism of the two acids  $CH_3.CH.CH.COOH$  as above stated.

When two carbon-atoms are united by three affinities, as in the case of acetylene, the union is represented by two tetrahedra coinciding by three points, that is, by one face. No illustration is given of this mode of combination.

The author considers that his new hypothesis leaves nothing unexplained which will admit of an explanation according to the views of chemical combination usually adopted; that it is in harmony with the observations of Rammelsberg, Herschell, and Pasteur respecting the activity both of crystals and of molecular groupings, and that as such it throws additional light upon a class of phenomena which have hitherto remained in great obscurity.

J. W.

### Determination of Melting Points.

By J. PICCARD (Deut. Chem. Ges. Ber., viii, 687—689).

A GLASS TUBE is drawn out to a capillary-tube and bent like a U. The substance is then introduced through the wider part and fused in order to stop up the bend, and the wider opening is then sealed up. This apparatus is then fixed by an india-rubber ring to a thermometer in such a way that the bend touches the middle of the bulb. On heating in a paraffin-bath, the substance, as soon as it melts, is driven up in the capillary-tube by the pressure of the air. If a substance contracts considerably on cooling, an air-passage might be formed, and in such a case a drop of mercury is placed above the body.

C. S.

**Intermittent Ebullition.** By T. L. PHIPSON  
(Chem. News, xxxi, 177).

WATER strongly acidified with hydrochloric acid, and containing a small quantity of benzene, was found to enter into violent ebullition every 60 seconds; after some time the boiling ceased completely, and then suddenly recommenced every 30 seconds. The flask still remaining over the source of heat, the periods of quiescence and violent ebullition dropped to 20, 10, and 8 seconds, at which interval the phenomenon continued for some time, the temperature of the vapour being  $101^{\circ}$ , that of the liquid  $103\cdot5^{\circ}$  during the whole time. When methyl alcohol was added to the above mixture, no ebullition occurred for a long while; it then commenced very suddenly and continued.

C. H. P.

---