

MOLECULAR WEIGHTS OF LIQUIDS

SECOND PAPER

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Consider a mixture of two liquids not miscible in all proportions. Express the composition of the mixture in gram-molecules of constituents per 100 grammolecules of the mixture.

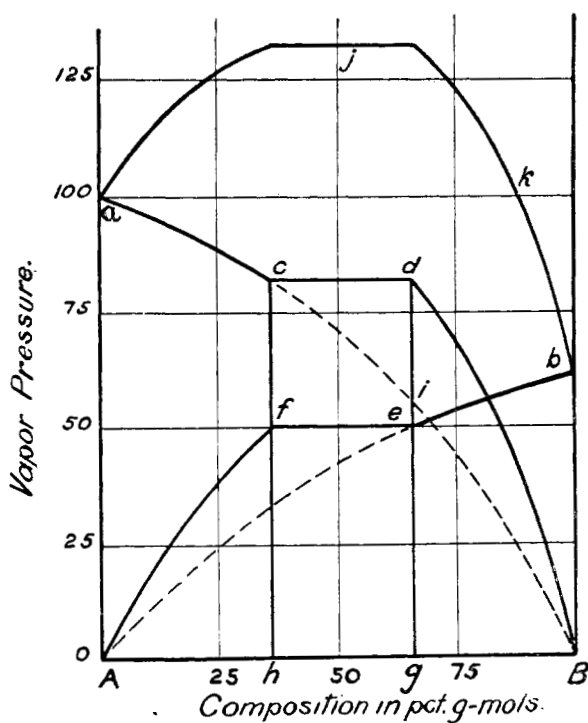


FIG. 1.

Let pure A have a vapor-pressure denoted by the ordinate Aa ; let pure B have a vapor-pressure denoted by the ordinate Bb , Fig. 1. The temperature is constant.

As B is added to A, the vapor-pressure of A decreases in some way, say according to curve ac . At c , which is some certain point varying with the mixture and the temperature, another phase appears, for the liquids are not miscible in all proportions. On further addition of B, this new phase increases at the cost of the first phase. On continued addition of B the first phase finally disappears entirely.

The vapor-pressure of A in the two phases is the same, but the quantity of B in the new phase is greater than in the first phase. Consequently, the composition of the new phase is represented by d to the right of c and on a level with it.

On further addition of B we get the unbroken curve dB for the vapor-pressure of A in the mixture after the first phase has disappeared. Similarly, when A is added to B, the vapor-pressure curve of B is $befA$.

It is evident that c and f lie on the same ordinate and that e and d likewise lie on the same ordinate.

Had a new phase not appeared at all, the vapor-pressure of A in a mixture corresponding to the composition denoted by d would have been gi . But as the second phase disappears, the vapor-pressure of A in the second phase is greater than gi . Hence B in the second phase has a molecular weight greater than B in the first phase has.

So the separation of a second phase in a mixture of liquids shows the sudden formation of more complex molecules on the part of one constituent. Similarly, when A is added to B.

It would seem therefore that when two phases are formed in a liquid mixture, a sudden increase in the molecular weight of each constituent is indicated. Curve $ajkb$ is the vapor-pressure curve of a mixture whose constituents have the vapor-pressure curves considered above.

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