Royal Academy of Sciences. Amsterdam.

PROCEEDINGS OF THE MEETING

of Saturday September 24th 1898.

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The following papers were read:

Chemistry. — „Congealing points and points of transition in mixed crystals of two substances". By Prof. H. W. BAKHUIS ROOZEBOOM.

In 1891 the author has laid down a theory on the building of mixed crystals from solutions. This theory was applied to equilibrium in systems of three substances.

Up to now no general rules had however been given for the building of mixed crystals from fused mixtures of two substances.

The investigations in this direction had either been limited to the influence of small quantities of the second substance on the fusing-point of the first (VAN 'T HOFF) or, as far as this had been extended to greater concentrations, it had been done without any theoretical guide and had led to false conclusions (KÜSTER).

It is possible to plan a survey of the different cases of equilibrium, which may present themselves between the fused mass and the mixed crystals by making use of the condition of equilibrium that the thermodynamic potential be a minimum.

Now VAN RIJN VAN ALKEMADE has already stated formerly, how in case of a continuous series of solid mixtures the potential

as a function of the concentration is represented by a similar curve as that representing the potential values of mixtures of two liquids. The problem therefore is to find out what cases may present themselves when these two curves are made to alter their relative positions, in passing from higher temperatures to lower.

The result of this investigation is, that where a continuous mixture-series exists, three cases are possible.

Case 1. The congealing points of mixtures of liquids of the substances A and B, fall gradually from the congealing point of B to that of A, in proportion as the composition of the fused liquid is shifted in the direction of A. (in case of B's being the substance having the highest fusing-point).

Case 2. The line of the congealing points shows a maximum.

Case 3. The line of the congealing points shows a minimum.

In all the three cases there is the following connection between the concentration of the fused and the solid mixtures:

The solid mixture contains, in comparison to the fused, a higher percentage of that ingredient, at the increase of which the congealing-temperature rises. In the maximum and in the minimum the two concentrations are equal.

Important conclusions for the process of congealing and fusing and for the fractionation of mixed crystals may be deducted from this.

If the mixture-series in the solid state is not continuous, it may be deducted that two cases are possible.

Case 4. The line of the congealing points shows a break in a transition temperature, situated between the fusing points of the two components. At this point occurs a hiatus in the composition of the mixed crystals.

Case 5. The line of the congealing points shows two descending branches, meeting in a minimum point, below which temperature every fusion congeals to a conglomerate of mixed crystals with two different concentrations

There may still appear further complications, should there exist more than one solid modification in either of the components or in both. Following the same lines that have led to the discovery of the connection between temperature, concentration of solid mixture and concentration of liquid, it is equally possible to find in what manner the transition takes place from one solid state into the other with different mixing-proportions both in case of homogeneous and non-homogeneous mixtures. The number of peculiar cases is here extraordinary, owing to the fact that in both components the corresponding conditions may follow each other in different manners

and the transition-temperatures may lie at different distances from each other.

The method given enables us to deduct the phenomena in each particular case and promises to be an important expedient in solving the complicated phenomena that appear in the congealing and the consequent changes in alloys.

Physiology. — *On the influence of salt-solutions on the volume of animal cells, being at the same time a contribution to our knowledge of their structure.* By Dr. H. J. HAMBURGER.

My investigations concerning the connection which exists between the power of salts to attract water and their power to extract colouring matter out of the red blood-corpuscles, led to the hypothesis that for every salt a solution might be found in which the corpuscles would retain the same volume that they have in their own serum. This supposition proved to be correct and it could moreover be shown that those solutions which left the volume unchanged represented a precisely equal hygroscopic power.

The experiments referred to, made in 1884 and suggested by the classic analysis of the phenomena of turgescence in plant-cells by our countryman, HUGO DE VRIES, have been to me as well as to others the point of departure for a series of researches which among physiologists and pathologists have awakened a constantly increasing interest in the new doctrine of osmotic pressure. To this result the theory of electrolytic dissociation of VAN 'T HOFF and ARRHENIUS has of late contributed. And in combination with each other these two theories are on the way to clear up many a dark point in the domain of physiology. One might have supposed that in the course of 14 years other animal cells would have been investigated in the same way as have been the red blood-corpuscles. This, however, has not been the case. For various purposes indeed the hygroscopic power of fluids, such as blood, lymph, serous fluid, milk, has been studied; to the serous and mucous membranes, indeed, fluids of different osmotic pressure have been offered for absorption, in order to deduce from the change in this osmotic pressure data for the knowledge of the resorption process; but the influence of salt solutions on any other than the red blood-cells has not yet been investigated. And yet for more than one reason this is to be desired. In the first place in order to control the inferences that have been drawn from the observations made with red blood-corpuscles, and to decide many differences of opinion which