III. L'espace projectif réel n-dimensionnel présente une lacune de chaque dimension $i = 2, 3, \ldots, n+1$. On peut combler ces lacunes avec des cellules $C_{i,1}$ aux incidences algébriques $A^i_{1,1}$ égales à 0 ou à 2 suivant que i est pair ou impair.

Chemistry. — *Examples of stable unmixing in binary systems: Salt + Water.* By H. G. BUNGENBERG DE JONG and L. W. J. HOLLEMAN. (Communicated by Prof. H. R. KRUYT).

(Communicated at the meeting of December 19, 1936).

In previous communications[1]) examples were given of unmixing in aqueous salt solutions which may be regarded as crystalloid analogues of the complex and auto-complex coacervation respectively of biocolloids.

It is to be expected that a closer examination of this unmixing in aqueous salt solutions may lead to a better understanding of coacervation.

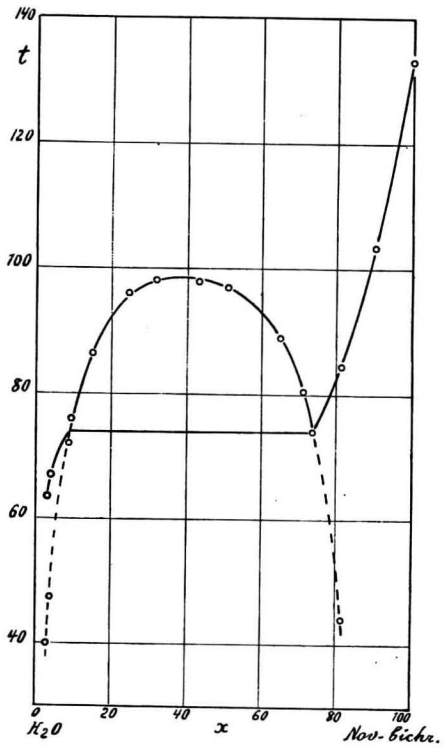

Fig. 1.

It is further a considerable simplification of the theory that already in binary systems: H_2O + salt, if the salt is well chosen, an area of unmixing may be found. A further construction of a t(temperature) — x(composition in percentages by weight) diagram for such an unmixing in the binary system H_2O + salt, however, had to be postponed till experimentally and preparatively we had become acquainted with suitable examples.

In the preceding communication incidentally we described cases of unmixing in mixtures of novocain (p. aminobenzoyl-diethylamino-ethanol-hydrochloride) solutions with solutions of other salts ($K_2Cr_2O_7$, etc.). The unmixed salt-rich layer in most cases easily crystallizes and the product of double decomposition may be purified by recrystallization. In this way a number of salts of the novocain base were prepared and each time

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[1]) H. R. KRUYT and H. G. BUNGENBERG DE JONG, Proc. Royal Acad. Amsterdam, **38**, 714 (1935). H. G. BUNGENBERG DE JONG and L. TEUNISSEN—VAN ZIJP, Proc. Royal Acad. Amsterdam, **39**, 1103 (1936).

the presence of the unmixing-area which was to be expected was examined in the binary combinations: Water + Salt.

Now it became apparent that in some of these systems between certain limits of temperature *stable* unmixing occurs, which is important from a theoretical point of view.

As an example follows the t—x diagram of the system water-bichromate of the novocain base (cf. fig. 1 where for the sake of brevity we indicated this salt by Nov.-bichr.).

This salt was prepared by double decomposition of novocain ($C_{13}H_{20}N_2O_2$. HCl) with $K_2Cr_2O_7$ in aqueous solution and repeated recrystallization of the obtained product out of water. Meltingpoint 133° C.

Analysis: Found for the content of $H_2Cr_2O_7$: 31.66 and 31.63 % respectively.

Calculated for $(C_{13}H_{20}N_2O_2)_2$. $H_2Cr_2O_7$: 31.59 %.

Reaction upon Cl ion negative.

The t—x diagram could be determined in a simple way by so-called "thermic analysis": weighed amounts of the salt and of water in closed ampullae of a volume of 1 cc were slowly heated in a water- or paraffin-bath.

At a rise of temperature, at 74°, the systems, the composition of which lies between 9 and 74 % of salt, so e.g. the 50 % mixture, change from the condition: crystals in equilibrium with saturated solution into two co-existing liquids (the crystals "melt under water") and become homogeneous only at a higher temperature.

The latter temperature may also be determined, starting from the homogeneous system, at a decreasing temperature. The disappearing and setting in respectively of a distinct turbidity was regarded as a criterion for the unmixing-temperature. The points of the unmixing-curve thus found, which indicates the composition of the co-existing liquids at each temperature, are all determined to 0.5° accurately.

At temperatures below 74°, where stable equilibria are only possible between crystals and saturated solution, nevertheless metastable unmixing may be easily realized. For this purpose the system is first heated till above the temperature at which the last crystals disappear (i.e. the saturation-temperature of the crystals at the given total composition of the system, which can be determined a little less accurately than the unmixing-temperatures) and then cooled. Crystallization usually does not occur then and in this way the unmixing-curve may be determined also in the metastable area. The changes in pressure on heating of the closed system, which besides contains a gas-phase, may be left aside as being of minor importance to the equilibria in the condensed system. Similar unmixing-areas undoubtedly exist also in the systems: water-perchlorate or rhodanide of the novocain base.

For the theory of the complex and auto-complex coacervation respectively the cases discussed here are of importance, for in case of coacervation

it seems that we have to deal with a stable unmixing. In how far this is indeed stable and does not remain to exist only as a result of an insufficient formation of crystal-germs or (and) of a too small crystallization velocity can of course not be decided as long as the expected crystalline "colloid-colloid salts" (e.g. gelatin-arabinate) are not yet known.

Between the complex coacervation and the analogous unmixing in crystalloid salt solutions thus far the apparently fundamental difference existed that in the latter case the analogous inter-relation between the two oppositely charged ions only seemed to allow metastable unmixing, i.e. where the "coacervate" was only passed as a transition-stage to the stable ordered-crystalline condition.

In the examples described here the unmixing above certain temperatures is indeed stable and the fundamental difference which we considered still present between complex coacervation and its crystalloid analogue consequently does not exist.

Leiden, December 1936.

Chemistry. — *The spreading of Protamine Insulinate.* By E. GORTER and L. MAASKANT. (From the Laboratory of the Children's Hospital of the University of Leiden, Holland.) (Communicated by Prof. J. VAN DER HOEVE.)

(Communicated at the meeting of December 19, 1936).

It is possible to combine the insulin with some basic group, so that the combination has its iso-electric point nearer to the p_H of the tissue fluid than insulin.

By combining the usual insulin hydrochloride (in solution p_H = about 2.5) with a protamine a compound is formed, which has its point of minimum solubility at about the p_H of the blood serum.

H. C. HAGEDORN, B. NORMAN JENSEN, N. B. KRARUP, J. WODSTRUP NIELSEN [1]) prepared a special insulin preparation which is absorbed more slowly and, therefore, has a more gradual effect than ordinary insulin. This "Leo Insulin Retard" is manufactured by the "Nordisk Insulin Laboratorium".

We have now studied the spreading of Leo Insulin Retard and an insulin-clupeïn complex, made by us.

GORTER and VAN ORMONDT [2]) showed that insulin is a very well-spreading substance. This protein shows a slightly diminished spreading at the acid side of the iso-electric point, which proves that the tendency to spread in a charged condition of the protein is high.

GORTER and his collaborators [3]) studied the spreading of artificially

[1]) Journ. Am. Med. Assn. Vol. **106** (1936).

[2]) Proc. Royal Acad. Amsterdam, **36**, 922 (1933).

[3]) E. GORTER, H. VAN ORMONDT, TH. M. MEYER, Biochem. J. **29**, 38 (1935).