

A STUDY OF THE SYSTEM, $C_{12}H_{22}O_{11}$ -- CaO -- H_2O WITH SPECIAL
REFERENCE TO THE APPLICATION OF THE PHASE RULE CRITERIA.

A. SUMMARY OF LITERATURE.

1. GENERAL.

The formation of additive compounds between Sucrose and Salts, both organic and inorganic, has been assumed for sometime and figures prominently in Geerlig's Theory of the Formation of Molasses¹.

A number of early workers in this field, notably Dubrunfaut and Kohler, have investigated the solubility of various salts in water and in saturated solutions of sucrose in water at the same temperatures. In some cases the solubility of the salt was found to increase, and in others to decrease. The general explanation was that the changes in solubility were due to the formation of compounds between sucrose and the salt present, the compounds so formed having solubilities different from those of the original substances.

In 1921 studies on the formation and nature of these compounds of sucrose and salt were conducted in Java by Helderma², who applied the Phase Rule to his results.

This investigator studied the systems sucrose--water and the salts K_2SO_4 , KCl , $NaCl$, and $AcOK(COOK)_2$ at $30^\circ C$, and arrived at the conclusion that no compounds were formed. Later, Kolthoff³ repeated this work on the system Sucrose-- $NaCl$ --Water, at $18^\circ C$ and $30^\circ C$, and showed that compounds are definitely formed and that Helderman failed to obtain them because he did not permit his systems to attain equilibrium conditions.

These results are in complete agreement with the work of Schoorl⁴ who studied the same system at $25^\circ C$, using a vapour tension method. The compound formed had the formula $C_{12}H_{22}O_{11}NaCl, 2H_2O$.

Experiments of this nature have been conducted from time to time to establish the nature of these compounds and fit them into agreement with Geerlig's Theory of Molasses Formation. Little work on the industrial side has been attempted until comparatively recently.

The system $C_{12}H_{22}O_{11}$ -- BaO -- H_2O , which was studied by Y. Hachihma⁵ (Japan) in 1928, is exceptional in this respect. This worker investigated the

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equilibrium solutions and solid phases at 25°, 45° and 75°C. Compounds were shown to exist. At 75°C these were $C_{12}H_{22}O_{11}BaO$, and $C_{12}H_{22}O_{11} \cdot 3BaO$. This work is of great value in establishing the conditions of formation of these compounds in connection with the Barium Saccharate method of extracting sucrose from molasses.

The system $C_{12}H_{22}O_{11}--SrO--H_2O$ has also been studied⁶ and compounds shown to exist.