THE ABSORPTION SPECTRA OF SOLUTIONS AS STUDIED BY MEANS OF THE RADIOMICROMETER; THE CONDUCTIVITIES, DISSOCIATIONS, AND VISCOSITIES OF SOLUTIONS OF ELECTROLYTES IN AQUEOUS, NON-AQUEOUS, AND MIXED SOLVENTS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649034475

The Absorption Spectra of Solutions as Studied by Means of the Radiomicrometer; The Conductivities, Dissociations, and Viscosities of Solutions of Electrolytes in Aqueous, Non-Aqueous, and Mixed Solvents by Harry C. Jones

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

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THE CONDUCTIVITIES, DISSOCIATIONS, AND VISCOSITIES OF SOLUTIONS OF ELECTROLYTES IN AQUEOUS, NON-AQUEOUS, AND MIXED SOLVENTS

BY

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WASHINGTON, D. C.
PUBLISHED BY THE CARNEGIE INSTITUTION OF WASHINGTON
1915

CARNEGIE INSTITUTION OF WASHINGTON
PUBLICATION NO. 210

PRESS OF GIBSON BROTHERS
WASHINGTON, D. C.

PREFACE.

The work recorded in this monograph, while apparently dealing with several subjects, is in fact closely connected, in that it all bears directly or indirectly on the present solvate theory of solution, which was proposed in the Johns Hopkins laboratory about fifteen years ago.

The work on the absorption spectra of solutions by Dr. Shaeffer and Mr. Paulus, using the radiomicrometer, led to results of the same general character as those obtained earlier by Dr. Guy and recorded in publication No. 190 of the Carnegie Institution of Washington. Solutions of some non-hydrated salts are about equally transparent with pure water, except at the bottoms of the absorption bands, where the solutions are more opaque. Solutions of hydrated salts are in general more transparent than pure water. All things considered, we regard this as the strongest evidence thus far obtained in favor of the solvate theory of solution.

The work of Dr. Smith, on the conductivity and dissociation of certain organic acids in water, is a continuation of that which has already appeared in publication No. 170 of the Carnegie Institution of Washington. The investigation by Dr. Wightman and Mr. Wiesel, on the conductivity of organic acids in alcohol, is a continuation of the work which has been in progress in this laboratory for more than ten years on the conductivity and dissociation of electrolytes in water as a solvent. (See publication No. 170 of the Carnegie Institution of Washington.) While this investigation is only preliminary, results of interest have already been obtained.

Dr. Wightman, Dr. Davis, and Mr. Holmes made a very exhaustive study of two simple salts in mixtures of alcohol and water, solutions in mixtures of these solvents showing abnormal properties.

The work by Dr. Davis and Dr. Hughes, on the properties of solutions in acetone, was taken up because of the abnormal behavior of acetone as a solvent.

The investigation by Dr. Davis and Mr. Putnam, of ternary mixtures of glycerol, acetone, and water, had in mind the fact that glycerol has a very high viscosity, water intermediate viscosity, and acetone a very low viscosity. The viscosities and conductivities of solutions in ternary mixtures of these solvents were studied. A general discussion of the results obtained, bearing on the solvate theory of solution, seemed desirable. The work as completed was published in a large

number of papers, and in a fairly large number of journals in America, Germany, England, and Switzerland. A general discussion of the results thus far obtained would render reference to the work more convenient. The last chapter of this monograph gives in concise form such a discussion and summary. A bibliography of the papers and monographs already published, bearing upon this theory, will make reference to the literature simpler.

Finally, it gives me great pleasure to thank the Carnegie Institution of Washington for the generous aid with which they have supported these investigations, and without which it would have been impossible to do much of this work.

HARRY C. JONES.

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