

**A POPULAR TREATISE
ON THE COLLOIDS IN
THE INDUSTRIAL ARTS**

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A Popular Treatise on the Colloids in the Industrial Arts by Kurt Arndt

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KURT ARNDT

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A Popular Treatise on
The Colloids in the Industrial Arts

BY



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TRANSLATOR'S PREFACE.

The warm reception and great approval with which the little volume of Prof. Dr. Kurt Arndt's "Die Bedeutung der Kolloide für die Technik" met in Germany make it very desirable that it becomes accessible also to the English-speaking chemists. It will be especially welcomed by those busy works-chemists who do not have the time to make a special study of the chemistry of the colloids, but who desire to keep abreast with the development of their science and the application of its various theories in the different industries.

This translation has been made from the second German edition which has been revised and considerably enlarged by the author. It was thought advisable to add an Index, which is missing in the German edition.

I feel it a pleasant duty to express here my thanks to the publisher of this translation, Prof. Dr. Edward Hart, proprietor of the Chemical Publishing Company, for his revision of my manuscript and for the great care in the preparation of the book for publication.

NAHUM E. KATZ.

MERIDAN, MISS., January, 1913.

PREFACE.

The present treatise originated from a lecture, which I delivered before the "Verein zur Befoerderung des Gewerbefleisses," in Berlin. Since this short lecture was favored with a very detailed abstract in the "Chemiker-Zeitung," and, since it found otherwise more attention than expected, I willingly complied with the request of the energetic publisher of the "Kolloid-Zeitschrift" to make my lecture accessible to larger circles, and to present a *popular* treatment of the subject of the intimate relation between colloidal chemistry and the Arts and Manufactures, in a separately issued volume. The chemist, who makes a special study of colloidal chemistry, will naturally find in the present unassuming treatise little which is new to him.

Since the purely scientific problems of colloidal chemistry were treated in the "*Introduction To Colloidal Chemistry*" by Pöschl,¹ I was in the position to limit myself to short introductory remarks in explanation of the most important ideas and terms, after which I entered into a more thorough discussion of technical matters. I have brought together a large quantity of material, which I have taken from technical magazines (preferably, from the "Zeitschrift für Chemie und Industrie der Kolloide"), partly from the book by A. Müller, "Allgemeine Chemie der Kolloide," (Leipzig, 1907), partly from my own book, "Technische Anwendungen der physikalischen

¹ This book has been translated into English.

Chemie," (Berlin, 1907), but I have not striven after completeness, but endeavored, to give the reader a *Vivid Picture of the Great Significance*, which the colloids have in numerous important processes. K. ARNDT.

Charlottenburg, New-Year, 1909.

PREFACE TO THE SECOND GERMAN EDITION.

In the two years, since the first edition of this treatise appeared, colloidal chemistry has rapidly developed. Numerous treatises, preferably, in the "Zeitschrift für die Chemie und Industrie der Kolloide" and their "Chemische Beihefte," have brought forth much which is of interest, and some which is of value to the industries. I have endeavored to do justice to all these developments within the scope of my treatise, by changes and considerable additions. The chapters on Dispersed Systems, Suspension- and Emulsion-colloids, in which I duly considered the new classification of colloidal chemistry and its terms, and, the chapter on the Colloids in the Mineral-kingdom, and in the Brewing-Industry are new.

To those who desire further information about scientific colloidal chemistry, the "Grundriss der Kolloidchemie" by W. Ostwald, (Dresden, 1911), the second edition of which has just appeared, may be recommended.¹

K. ARNDT.

Charlottenburg, Easter, 1911.

¹ A third edition of this book has already appeared.

1. **Definition of the Term "Colloid."**—The name "*Colloid*" is connected with the Greek word $\kappa\omicron\lambda\lambda\alpha$ = glue, and means "glue-like"; it was first used by Th. Graham half a century ago. This English chemist termed as *Colloids* various substances, which, indeed, chemically, have nothing to do with glue, but which resemble in appearance the soaked-up cabinet-maker's glue, as, for instance, the gelatinous precipitate which is obtained when muriatic acid is added to a concentrated solution of waterglass. From sodium silicate, hydrochloric acid separates a voluminous jelly, which, by washing, we can free almost completely from the salt. By heating, we gradually expel the large quantity of water which is absorbed by the jelly, and at last obtain a pulverulent mass which gives off the last traces of its water only when it is strongly ignited. Heated over an oxy-hydrogen flame the silicic acid melts and on cooling congeals to a transparent glass, quartz glass. But if we let the mass cool extremely slowly, then the quartz-glass transforms into small crystals. So we have for one and same substance, silicic acid, three different states: the *colloidal*, the *glassy* and the *crystalline* state. In a strict sense, silicic acid has several crystalline states, since it is found in several crystalline forms, of which rock-crystal presents an especially beautiful example. One of these states, the hexagonal crystalline form of