

"The General, Selective, and Specific Formation of Complexes by Metallic Cations" by G. Schwarzenbach. The author surveys the course of reactions when water molecules in the hydration shell of a metallic ion are replaced by other ligands "in order to point out some empirical regularities without giving more than an indication of their theoretical interpretation." In six tables are given formation constants for some well known complexes (28 pp., 70 ref.). (7) "Atmospheric Activities and Dating Procedures" by A. G. Maddock and E. H. Willis. This is an excellent review of the experimental techniques for the radiocarbon method of dating, critically examining the sources of error and the fundamental assumptions on which the method is based. The use of tritium for dating is also discussed (48 pp., 286 ref.). (8) "Polyfluoroalkyl Derivatives of Metalloids and Nonmetals" by R. E. Banks and R. N. Haszeldine. This chapter deals with the preparation, the chemical and physical properties of the known polyfluoroalkyl derivatives of mercury, boron, silicon, nitrogen, phosphorus, arsenic, antimony, oxygen, sulfur and selenium. Many of the data are presented in 20 tables (96 pp., 210 ref.).

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**Microchemical Journal Symposium Series. Volume 1. Submicrogram Experimentation.** Based on a Symposium Sponsored by the National Academy of Sciences and the National Research Council, Arlington, Virginia, May 15-18, 1960. Edited by NICHOLAS D. CHERONIS, Brooklyn College of the City University of New York. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1961. viii + 351 pp. 16 × 23.5 cm. Price, \$12.75; \$10.75 (paper).

This book contains the Proceedings of the Conference on Submicrogram Experimentation, a symposium limited to 29 participants. A total of 22 papers with discussions and a summary of the symposium are published here.

The submicrogram region is defined as that which includes masses from  $10^{-9}$  g. to near the range of individual molecules. The methods used for study include activation analysis, emission spectrography, flame photometry, absorption spectrophotometry (ultraviolet, visible and infrared), mass spectrometry, X-ray spectroscopy and diffraction, fluorescence, density measurements, electrophoresis, magnetic susceptibility, micro- and macrobiological assay methods, enzymatic studies, paper chromatography, gas chromatography, olfactory sensing, microscopic examination (light and electron) and microcoulometry.

Diverse problems which necessitate working in this region include criminalistics, trace elements in high purity materials, marine chemistry, synthetic elements which are very limited in quantity, functions of trace substances in the growth of various organisms, carcinogenicity, serum analysis, atmospheric pollution, pesticide residues, analysis of tissue sections, and cytochemical studies.

As has been known for a long time, biological systems are very sensitive to small quantities of certain substances. Therefore, it is no surprise that much of the work in the submicrogram region has been done by investigators in the biological field. A large proportion of the papers in this book are biological in application. These studies most often involve trace quantities in large amounts of total sample, and separations are necessary before quantitative estimations are possible. Much of the effort in trace quantity studies is devoted to the separation of the desired material. Studies involving single cells and those on extremely limited quantities of sample deal with total quantities in the submicrogram region.

A few of the devices used are specially tailored for the small quantities, but many of the techniques consist of adaptations of existing equipment and instruments to handle the small quantities as may be seen from the list of the methods used.

Because of the diverse natures of the problems discussed, the book is extremely interesting. The fact that it is a compilation of individual papers given at a symposium yields a variety in styles of writing, in detailed content and completeness. The papers range from a rather thorough discussion of one phase of one technique (detector systems in gas chromatography) to more general descriptions of various

techniques available. Very few of the papers contain sufficient detail to enable one to go directly into the laboratory and apply the technique. On the other hand, the book would be an excellent starting place for one interested in submicrogram analysis to find what techniques have already been devised.

In comparison to other books of this nature, the price may not be out of line, but none-the-less this reviewer feels that for the size and content this book is somewhat overpriced.

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**Verfahrenstechnik in Einzeldarstellungen. Band 11. Experimentelle Vermessung von Dampf-Flüssigkeits-Phasegleichgewichten dargestellt am Beispiel des Siedeverhaltens von Fettsäuren.** Von DR. R. MÜLLER, Hamburg, und DR. H. STAGE, Köln-Niehl. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany, 1961. viii + 117 pp. 15.5 × 23.5 cm. Price, DM. 21.—.

Measurements of the isobaric liquid-vapor equilibria give indications of the distillation behavior. This fact is of particular importance to the oil and fat industry. The authors have summarized in this book their work for a series of saturated even numbered, straight chain, fatty acids; these data supersede previous books describing experimental work in this field which are now out of date. The book consists of seven chapters and a total of 254 references through 1958. The authors have emphasized the newer types of apparatus which make such measurements not only much faster but also much less complex.

After an introduction and discussion of the importance of the determination of the vapor-liquid equilibria of fatty acids, the authors describe in Chapter II the operations involved in the preparation of pure fatty acids. They then discuss a number of previously used distillation columns; this leads into a detailed description of their distillation column with automatic control of distillation rate, heating temperature, distillation pressure, temperature of the cooling water, temperature registration, sample takeoff, etc. Descriptions are also given for the crystallization for the higher fatty acids from  $C_{14}$  on.

In Chapter III, the authors give the exact vapor pressure curves determined for the fatty acids from  $C_6$  through  $C_{24}$  as well as tables of melting points. Chapter IV gives a detailed description of the authors' investigation of the temperature stability and sample analysis, in addition to phase equilibria for fatty acid mixtures of  $C_6$ - $C_8$ ,  $C_{10}$ - $C_{12}$ ,  $C_{14}$ - $C_{16}$ , at various pressures; this is followed by tables of melting and solidification points for the same series of fatty acid mixtures. It also includes a discussion of the thermal stability of fatty acids at several temperatures with various lengths of heating time.

In Chapter V the apparatus used for the phase equilibria studies is described in detail. It is so constructed that the known source of error of previously described apparatus has been taken into consideration. This apparatus was tested by determining the equilibria for mixtures of acetone-benzene as well as 2-methylnaphthalene-decanone; the resulting values were checked by thermodynamic methods. Equilibrium measurements of fatty acids included the mixtures:  $C_6$ - $C_8$ ,  $C_8$ - $C_{10}$ ,  $C_{10}$ - $C_{12}$ ,  $C_{12}$ - $C_{14}$ ,  $C_{14}$ - $C_{16}$ . Each mixture was measured at three pressures. In order to evaluate these measurements, exact vapor pressure data were necessary. The literature values within the homologous series were checked and a formula was derived which gives vapor pressure curves for the higher fatty acids. The results of the vapor pressure measurements indicate that slight deviations from ideal behavior are found. This difference increases with falling temperatures. The association phenomena in these acids is discussed in this context.

The final two chapters include an evaluation of the reported results in terms of their thermodynamic significance as well as a discussion of further investigations which are necessary in this field.

Numerous tables for melting points, solidification points, vapor pressure curves and phase equilibria in addition to descriptions of the experimental apparatus used for these