
Book review

Organo-Clay Complexes and Interactions by Shmuel Yariv and Harold Cross (Editors), Marcel Dekker, Inc., New York, 2002, 688 pp, ISBN 0-8247-0586-6

The importance of clay minerals and their interactions with organic matter cannot be over-emphasized. The fields of interest involve disciplines like soil science, agriculture, mineralogy, geochemistry, environmental science and engineering. Although a systematic study of clay-organic interactions dates back to the beginning of the 20th century, a real breakthrough can be witnessed with the advent of sophisticated structure elucidation methods (e.g. infrared and Raman spectroscopy, simultaneous thermal analysis and mass spectrometry).

This book in about 700 pages presents a most readable account of the progress made in this field and gives a report on the advanced techniques and their contribution to our knowledge of organo-clays. The book is organized into 11 chapters. Chapter 1 (by *Shmuel Yariv and Kirk H. Michaelian*) gives an overview of the structure and classification of clay minerals with particular respect to their surface acidity. Chapter 2 (by *Shmuel Yariv*) is a general introduction to –and a comprehensive study of– organo-clay complexes and interactions. The types of possible interactions in the environment and industrial processes are surveyed and a study of adsorption sites for organic compounds is given. A model is proposed for the structure of the double layer in the presence of organic aliphatic, long chain ions or molecules. The mechanism of adsorption of organic compounds inside the interlayer space of swelling minerals (e.g. smectites and vermiculites) as well as on the external surfaces and inside the tunnels of sepiolite and palygorskite is discussed in detail.

Chapter 3 (by *J. L. Pérez-Rodríguez and C. Maqueda*) provides an up-to-date summary of the references on the interactions of vermiculites with a great variety of organic compounds from various amines through pesticides to surfactants. An interesting part of this discussion is the interaction of clay minerals with organic compounds of biological interest.

Chapters 4 (by *R. F. Giese and C. J. van Oss*) is devoted to organophilicity and hydrophobicity of organo-clays, centered principally on the smectite group.

Chapter 5 (by *Shlomo Nir, Giora Rytwo, Tamara Polubesova, Tomás Undabeytia and Carina Serban*) gives an account of experimental studies and model calculations on adsorption of organic cations on several clay minerals. A survey of basic equations is made and the computational procedure is described. The effect of ionic strength on adsorption of organic cations to yield predictions is touched upon as well.

Chapters 6 (by *J. Sanz and J. M. Serratosa*) deals with nuclear magnetic resonance spectroscopy of clay minerals and organo-clay complexes. Selected examples were chosen to

illustrate the applicability of the technique e. g. for the study of orientation, interaction, and mobility of species in the interlamellar space.

Chapter 7 (by Anna Langier-Kuźniarova) reports on the most recent studies of clays and organo-clay complexes by thermal analysis techniques. After a thorough analysis of methodological problems, a detailed survey of the thermoanalytical investigations of kaolinite intercalation complexes as well as complexes of talc and pyrophyllite, vermiculite, illite, sepiolite and palygorskite minerals is given.

Chapter 8 (by Shmuel Yariv) deals with the use of infrared and thermo-infrared spectroscopy in the study of the fine structure of organo-clay complexes. These investigations made possible the identification of the type of bonds formed between functional groups of the adsorbed organic compounds and the active sites of the clay surface. Adsorption of amines, hydroxylic compounds, carboxylic acids, amino-acids, carbonyls, amides, nitriles, as well as various phosphorous- and sulphur-containing compounds is investigated.

A separate chapter (Chapter 9 by Shmuel Yariv) is devoted to staining of clay minerals and to the visible absorption spectroscopy of dye-clay complexes. A review of the literature to summarize the current knowledge on the coloration of clay minerals by different reagents/reactions is provided. The capability of visible absorption spectroscopy to give an insight into the adsorption process of colored organic compounds by clay minerals is clearly demonstrated.

One of the strong points of Chapters 6 to 9 is the special attention paid to the handling of methodological problems and to the exploitation of available experimental results.

Chapter 10 (by L. Heller-Kallai) deals with organic reactions catalyzed by clay minerals. A summary of the various factors influencing the process of clay catalysis is given. The effect of the interplay of the different clay properties was illustrated via the discussion of some selected clay-catalyzed reactions.

Chapter 11 (by Noam Lahav) is unique in the sense that it reviews various ideas and theories that relate clay minerals to the origin of life on Earth.

This book is a perfect choice for those who search for a comprehensive study of clay-organic interactions as well as the structure and properties of organo-clay complexes. The declared „imperfection” of the book -the lack of important topics like the discussion of colloidal behavior as well as the environmental and industrial applications of organo-clay complexes in detail- will hopefully be compensated by the appearance of a second volume. The clarity and style as well as the wealth of illustrations make the book an enjoyable reading for researchers and advanced students alike.

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**Introduction to Thermal Analysis by Michael E. Brown, Second Edition
Kluwer Academic Publishers, Dordrecht/Boston/London, 2001, 264 pp,
ISBN 1-4020-0211-4**

The time goes on very fast. It is unbelievable that the first edition of this excellent monograph appeared fourteen years ago and nearly one and a half generation have used to obtain basic information on various methods in the field of thermal analysis. But many things have changed during that time. It is worth referring only to data acquisition and evaluation which can now be comfortably handled by computers.

In this Edition, almost all of the sections of the First Edition have changed and updated. The author's main concept and the guiding thread of the book declared in the Preface were to use logical scheme developed by Dr. W. Hemminger and the ICTAC Nomenclature Committee. It can be read in the Introduction in detail. Accordingly, the proposed new definition is: *Thermal Analysis (TA) means the analyses of a change in a property of a sample, which is related to an imposed temperature alteration.* 'Thermoanalytical techniques' characterized by the suffix '-metry' and 'thermoanalytical methods' indicated by adding 'analysis' are also distinguished from each other. Table 1.2 and 1.3 summarize primary and special TA techniques, methods and abbreviations based on the new concept. The new system is very logical and both journal editors and manufacturers play a significant role in insisting on practical usage and acceptance. I agree with the author, that the system will undoubtedly criticized, but the development of the latest dedicated techniques and methods raises the complexity and unresolved nature of the nomenclature question. The next chapter, Thermal Events, is a brief description of the main characteristic features of the solid state, thermal events on heating a single solid and the main type of solid state reactions.

The following chapters discuss the basic, most frequently used thermoanalytical techniques and methods.

Chapter 3 deals with Thermogravimetry (TG). It starts with a brief description of several types of balance mechanism, the furnace-sample arrangements, the measurement and control of temperature, the calibration and some very important influencing factors, such as atmosphere and properties of the sample. Then the explanation of Sample Controlled Thermal Analysis (SCTA) methods follows: the controlled or constant rate thermal analysis (CRTA), the temperature jump method, the rate-jump method and the high resolution, Hi-Res TG method. Thermomagnetometry (TM) is also discussed here. The chapter ends with the explanation of presentation of TG data and some representative application of thermogravimetry.

The next chapter is a introduction to Differential Thermal Analyses and Differential Scanning Calorimetry including the theory and instrumentation, comparison of the principles, quantitative aspects and interpretation of curves. The theory and advantages of Modulated Temperature Differential Scanning Calorimetry (mt-DSC) are also discussed. One can find very useful application examples at the end of the chapter.

Thermooptometry (also referred to as thermo-optical analysis, TOA) is used to discuss among less-common techniques. Now it is an independent chapter giving a survey of

thermomicroscopy, thermophotometry, thermoluminescence, combined techniques and Micro Thermal Analysis.

Chapter 6 reports on Thermomechanometry techniques introducing the theory, instrumentation and application of thermodilatometry (TD), static force- (sf-TM), dynamic force- (df-TM) and modulated force thermomechanimetry (mf-TM).

Chapter 7 shows the principles and equipments of combination of thermal analysis techniques involving measurements of two or more properties on the same portion of the sample during a single temperature program.

Many samples, on heating, release gases or vapour through desorption or decomposition. Evolved gas analysis (EGA) deals with the detection or detection and identification of the gases evolved. Chapter 8 discusses the most common coupled techniques and selected examples were chosen to illustrate their applicability.

Some of the techniques of thermal analyses, based on monitoring less-obvious properties of a sample and often requiring more specialized equipment, are grouped under the heading of less-common techniques. Chapter 9 describes Emanation Thermal Analysis (ETA), Thermoelectrometry and Thermosonimetry.

Reaction kinetics is a crucial point in thermal analysis. Chapter 10 gives a short, but excellent survey from the theory of solid state kinetics to the publication of kinetic results.

Chapter 11 is devoted to the detailed theoretical background and calculation procedure of purity determination using DSC.

Appendix contains very useful data. Namely, it gives up-to-date overview on the literature of thermal analysis, major suppliers of equipment (together with their addresses and websites), explains data processing procedures and proposes introductory experiments.

This book is an excellent, well-balanced and illustrated, updated version of the first edition. It is perfect choice for those who wish to explore the field of thermal analysis and an enjoyable reading for researches, too.

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