

Book Review

Peter J. Haines, *Thermal methods of analysis, principles, applications and problems*, Blackie Academic & Professional, London 1995, XXII+286 pages. Price: £27,50

This book results from a lecture series at the Kingston University and several meetings of the Thermal Methods Group of the UK.

It addresses advanced students as source for lectures or practical studies as well as users of thermal analysis in industry and research.

The book is divided into six chapters. It begins with a 20-page introduction into thermal analysis and with a synopsis of general factors equally valid for all thermoanalytical methods. The second chapter deals on 40 pages with thermogravimetry, where it concentrates on examples of use by means of which certain measuring and evaluation procedures are explained. The third chapter with 60 pages concerning differential thermal analysis and differential scanning calorimetry originates from a co-operation with F.W. Wilburn. After a description of the fundamental differences between DTA, power-compensated and heating-rate DSC, examples of use give a review on the manifold application possibilities. A short review on Pressure DSC, photocalorimetric DSC and temperature-modulated DSC completes this chapter. The fourth chapter (in co-operation with M. Reading) considers on 38 pages thermo-mechanical, dynamic mechanical and associated methods. Before discussing classical mechanical methods and then electrical methods (dielectric analysis), an interesting review is given on the mechanical behaviour of substances. On 45 pages the fifth chapter introduces simultaneous methods and methods for production analysis as TG/DTA and TG/DSC, respectively, evolved gas analysis, spectroscopic methods, gaschromatography, thermal microscopy, X-ray methods, and electron

microscopy. Less common methods are briefly introduced (emanation thermal analysis, thermoluminescence examinations, thermomagnetometry, thermosonimetry) with at least one reference to the literature where further information can be sought.

The book's origin reflects on the didactic skilful construction of the chapters, which are, in general, divided into introduction, a historic review, definitions, instruments, theory, calibration and applications. Besides, it concentrates on precise examples of use as well as on numerous exercises that makes the book particularly suitable for self-instruction.

The final and with 76 pages longest chapter introduces many applications and analytical problems in the field of inorganic materials, polymers, fine chemicals and pharmaceuticals and other materials. Here, the reader is encouraged to reflect on and to solve problems independently. The answers are given in the second part of the chapter.

One criticism is, however, that generally valid concepts, e.g. determination of kinetic parameters or reaction-rate controlled thermal analysis, are discussed in the chapter on thermogravimetry, without that the reader gets aware that these methods are equally applicable in DSC (kinetics!) or TMA (reaction-rate controlled sintering), though corresponding examples/problems are presented.

Considering the target group that possibly has less physico-chemical background knowledge than the thermal analyst, a consequent adherence to the nomenclature recommendations of ICTAC and IUPAC would be desirable (e.g. Pa instead of psi or atm). As well, the theory of DTA and DSC is treated quite superficially and qualitatively. A more detailed description applying adequate mathematical models would have facilitated the comprehension of this important section of the thermal analysis, especially, if the applied mathematical symbols and abbreviations

had been chosen more comprehensively and valid throughout the whole book. However, the literature references are helpful and good, which are subdivided into special articles and a general bibliography.

It is important and positive that the author certainly knows how to convey interest if not enthusiasm for the thermal analysis, but continually points out how important it is to critically look at the results. He warns against relying upon the universal computerisation with its nice coloured outputs without any special message quality (“garbage in garbage out”). The calibration problem of different instruments is as well mentioned.

The book is indeed recommendable for all those who have experience and practice in thermal analysis.

Here, both, the technical engineer finds valuable metrological advice as well as the engineer or scientist interesting impulses for potential application of the thermal analysis.

As entry, it can be recommended for beginners, provided that an experienced colleague or the detailed literature stated is consulted, in order to clarify some open points and misunderstandings.

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