

Book Reviews*

Thermal Analysis of Pharmaceuticals. Edited by D. Q. M. Craig and M. Reading. CRC Press, Boca Raton, Florida, 2007.

Thermal Analysis is an important, and an increasingly employed, technique in the analysis of the solid state. Despite its significance, particularly in pharmaceutical development, it has always been poorly represented either by books or by significant reviews. Many of the earlier works were dominated by inorganic and polymer applications. The excellent text by Ford and Timmins, *Pharmaceutical Thermal Analysis* (Ellis Horwood, 1989), marked the first recognition of the need for a specialized text for the pharmaceutical industry. It is however now long in the tooth as is the substantial review by Giron (*Thermochim. Acta* **1995**, *248*, 1–52). Other books, reviews and manufacturers' booklets have since appeared, but there has been a long-felt need for a major account of the range of applicable thermal techniques, reflecting the considerable advances in instrumentation over the past decade. The present book, edited by two major practitioners in the field, and with contributions from well-known academic and industrial authors, is therefore very welcome. There are three chapters on aspects of DSC, and two on TGA, which account for almost half of the book, a balance reflecting the dominance of these two techniques, particularly in pharmaceutical usage. Other chapters cover modulated DSC, high sensitivity DSC, thermorheology, thermomicroscopy, isothermal calorimetry and thermally stimulated current spectroscopy. The approach is very thorough. The theory, practice, and applications of each of these techniques are presented. The combined authority of the authors guarantees that the book represents a substantial contribution to the understanding and use of the different facets of thermal analysis. One of its strong features is the warning given in many chapters that thermal behaviour may be more complex than it superficially appears to be and it is important to check that the thermal events observed really are due to the interpretation proposed. The need to use thermal methods in combination with other methods to confirm conclusions is also frequently mentioned.

However, the book reads as though written around the year 2000. For example, the word "recent" is applied in different chapters to a 1994, a 1997, and even a 1988 reference. The list of references accompanying each chapter confirms this with a dominance of 1990s references with an occasional token reference published in 2000–2006. Indeed, some chapters contain no post-1999 references. There is no chapter

on combined DSC and TGA, although the chapter on TGA applications does discuss combined TGA and DSC. It is difficult to remember that a decade ago the combined instrumentation was in its infancy, so this chapter arrangement again reflects past rather than common current practice. Since one knows that many of the authors are still active in their specialized fields, it seems improbable that the delays were due to the difficulty of extracting the manuscripts. The foreword hints at delays with the statement, "... this book has been longer in the making than we originally intended...".

Inevitably, a multi-authored work will suffer from mixtures of styles and of levels of presentations, but it is difficult to picture the typical reader at whom the book is directed. Some of the articles are clearly suitable for the general reader, presenting a useful overview of the technique, for example the thoughtful chapter on isothermal calorimetry. By contrast, the chapter on thermorheology contains a very detailed account of the background theory of viscosity and elasticity. Mastery of this chapter would put one well on the road to expertise both in rheology and thermorheology. The chapter on thermomicroscopy is perhaps the least satisfying, displaying the least sure touch of any of the presentations. It records many of the useful features of the technique yet fails to emphasize those of most value: for example, the identification and generation of polymorphs at the earliest stages of investigation using minute amounts of material, with the simultaneous acquisition of seeds and of preliminary kinetic data; or the use of the stage to determine eutectic formation, so valuable in the rapid screening of cocrystals. The substantial lists of equipment and accessories fail to highlight the most significant. The widely used Linkam hot-stage is only mentioned in the tables of available instrumentation, whilst the text confidently asserts that the Kofler stage is no longer available, when in fact it has been available for many years from Wagner and Munz of Munich. Nor is there mention of that useful time-saving adjunct to hot-stage microscopy, also due to Kofler, the graduated hot-block. Neither the fine book by Hartshorne and Stuart, *Crystals and the Polarising Microscope*, nor the contribution by Kuhnert-Brandstaetter in the Comprehensive Analytical Chemistry series is mentioned in the literature lists. The chapters on DCS and TGA are likely to be the most perused. They are generally both deep and wide ranging, although the absence of the determination of purity by analysis of the melting endotherm is surprising. The process chemist will note that safety calorimetry is not amongst the chapters nor even mentioned in the book. The chapter on Thermally Stimulated Current Spectroscopy is particularly valuable, because it is

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difficult to find an accessible account of the theory elsewhere. However, echoing previous comments, there is no open literature reference beyond 1997, despite the significant papers on this topic produced in the past decade by several of the contributors to this chapter.

Had I been reviewing this book at the millennium, I could have recommended it enthusiastically. It still remains a sound exposition of thermal methods, but those wishing to be apprised of the advances and applications of the past few

years will have to search elsewhere for their information, or await an updated edition of this book.

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