

## Book review: Thermal Analysis and Thermodynamic Properties of Solids (2nd Edition) by Jaroslav Šesták, Elsevier 2021, ISBN: 9780323855372

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The book covers foundational principles and recent updates in the field of thermal science, presenting an authoritative overview of theoretical knowledge and practical applications across several fields. Since the first edition of this book was published in 2005, great progress has been made in the theoretical understanding - and subsequent ability to assess and apply - of the principles of thermal analysis, especially in thermodynamic intention with emphasis on temperature conditions. Features twenty-chapter contributions on 660 color pages provides an up-to-date cutting-edge themes involving the thermal analysis, thermotics, thermodynamics, thermal and applied solid-state physics, macro- and micro- dimensional approach to selected materials and their thermal properties.

The book provides the latest and most exceptional look at theoretical thermal analysis performed with processes out of thermal equilibrium (non-isothermal) and should become an essential part of all libraries of institutions with a similar material approach. It contains significant chapters featured in the book in two parts. Basics, such as

1. Thermophysical examinations, experimental set-ups, sample and temperature control
2. Understanding of temperature, heat, gradients and related thermodynamics
3. Phenomenological approach to the caloric theory of heat: An alternative thermodynamics
4. Thermostatics as textbook thermodynamics
5. Equilibrium background and its importance for temperature and particle size
6. Thermodynamics: Processes dynamics under constant heating
7. Thermotics: Theoretical thermal analysis, thermometry and calorimetry
8. Rationality of creating kinetic models: how to mold a reaction path in solid-state
9. Facilitated reaction kinetics by thermal analysis
10. Thermokinetics in DTA experiments
11. Physical thermokinetics of reversible thermal decomposition by thermogravimetry
12. Exploiting fractals, tackle thermal processes and truer non-isothermal kinetics,
  1. and practical applications comprising of
13. Constrained states of glasses, exploitation of transition temperatures, glass -forming coefficients and concepts of fragility
14. Explanation of crystallization kinetics of both glasses during heating and melts on cooling while indicating the incorrectness of Kissinger method

15. Kinetic phase diagrams as an enforced consequence of rapid changing temperature or diminishing particle size
16. Thermodynamic description of mobile components behavior in non-stoichiometric partially open ceramic systems and superconductor model
17. Thermodynamics of periodic processes, dendrite self-similarity, self-organization and stimulated quantum diffusion
18. Non-bridging oxygen in silica bio-compatible ceramics, poly-sialates and geo-polymers
19. Thermodynamics and social behavior, econophysics and ecosystems applied in relation of laws against feelings
20. Thermal analysis scheme aimed at better understanding of the Earth's climate changes due to the alternating irradiation.

See: <https://www.elsevier.com/books/thermal-analysis-and-thermodynamic-properties-of-solids/sestak/978-0-323-85537-2>

In addition, it contains very convincing introductory matter such as “Anniversary of the half-century development and formation of a new field of thermal analysis” providing detailed description of the early development and “Glossary of terms, definition and symbols” giving an important overview of the meanings further elaborated in the text. Important is the section “Literature”, which is concentrated on 71 separate pages containing almost two thousand multiple citations, including the titles of articles covering practically everything available on individual topics. The book will become an important tool for advanced undergraduates, graduate students, postdoctoral fellows, researchers, and lecturers working in the field of thermodynamic studies and thermophysical measurements, who will find this collection invaluable, as were the books once available at the beginning of 1960s of the field emergence.

The author Prof J. Šesták is a multi-award-winning scientist, educator, photographer and mountaineer, awarded for his life achievements in solid-state chemistry and physics by Dr.h.c. in 2010 and by the highest Czech honor given by the President in 2017. He has worked around the world, including positions at the Nuclear Centre in Studsvik, (Sweden), University of Missouri at Rola (USA), Kyoto University (Japan), Norwegian University of Science and Technology (Trondheim), Taiwan National University (Taipei), Institute of Physics, Charles University, Czech Technical University in Prague, University of West Bohemia in Pilsen and University of New York in Prague (Czech Republic).