Hot topics of thermal analysis

New books on glass thermophysical research and open-access web site <Thermotics.eu>

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Variability of constrained states and its impact on thermoanalytical measurements shaping the series “hot topics of thermal analysis”

In the year 2000 Journal of thermal analysis and calorimetry published two key papers on the research lengthiness concerning noncrystalline states [1, 2], which resulted from numerous articles dealing with the behavior of constrained states [3–6] and matching the modern appeal of glassines. This subject is factually younger than the detection of radioactivity and is still rapidly developing [7–13].

The idea of collecting broader viewpoints toward the formation and devitrification of glasses, particularly aimed at the confrontation of various aspects of descriptive theories, evaluative treatments, and applied technologies within the viewpoint of thermal analysis were a subject of journal special issues [14, 15]. However, it is the first time that this subject is deeply treated in the book series [16, 17], the contents of which is survived herewith in more details.

Hot topics of thermal analysis, Volume 8 [16]

1. Introduction: Some Essential Attributes of Glassiness Regarding the Nature of Non-crystalline Solids (Hiroshi Suga)
2. Heat Capacity and Entropy Functions in Strong and Fragile Glass-Formers, Relative to Those of Disordering Crystalline Materials (C. Austen Angell)
3. Vibration Forms in the Vicinity of Glass Transition, Structural Changes and the Creation of Voids When Assuming the Role of Polarizability (Jaroslav Šesták, Bořivoj Hlaváček, Pavel Hubík, and Jiří J. Mareš)
4. Some Aspects of Vitrification, Amorphisation and Disordering and the Generated Extent of Nano-Crystallinity (Jaroslav Šesták, Carlos A. Queiros, Miroslav Holeček, and Jiří J. Mareš)
5. Basic Role of Thermal Analysis in Polymer Physics (Adam L. Danch)
6. Phases of Amorphous, Crystalline, and Intermediate Order in Microphase and Nanophase Systems (Bernhard Wunderlich)
7. Thermal Portrayal of Phase Separation in Polymers Producing Nanophase Separated Materials (Ivan Krakovský and Yuko Ikeda)
8. Solid Forms of Pharmaceutical Molecules (Bohumil Kratochvíl)
9. Chalcogenide Glasses Selected as a Model System for Studying Thermal Properties (Zdeněk Černošek, Eva Černošková, and Jana Holubová)
10. Viscosity Measurements Applied to Chalcogenide Glass-Forming Systems (Petr Košťál, Jana Šhánělová, and Jiří Málek)
11. Thermal Properties and Related Structural Study of Oxide Glasses (Marek Liška and Mária Chromčíková)

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12. Oxide Glass Structure, Non-bridging Oxygen and Feasible Magnetic Properties due to the Addition of Fe/Mn Oxides (Jaroslav Šesták, Marek Liška, and Pavel Hubík)
13. New Approach to Viscosity of Glasses (Isak Avramov)
14. Transport Constitutive Relations, Quantum Diffusion and Periodic Reactions (Jiří J. Mareš, Jaroslav Šesták, and Pavel Hubík)
15. In-Situ Investigation of the Fast Lattice Recovery during Electropulse Treatment of Heavily Cold Drawn Nanocrystalline Ni–Ti Wires (Petr Šittner, Jan Pilch, Benoit Malard, Remi Delville, and Caroline Curfs)
16. Emanation Thermal Analysis as a Method for Diffusion Structural Diagnostics of Zircon and Brannerite Minerals (Vladimír Balek, Iraida M. Bountseva, and Igor von Beckman)
17. Scanning Transitiometry and Its Application in Petroleum Industry and in Polymer and Food Science (Jean-Pierre E. Grolier)
18. Constrained States Occurring in Plants Cryo-Processing and the Role of Biological Glasses (Jiří Zámečník and Jaroslav Šesták)
19. Thermophysical Properties of Natural Glasses at the Extremes of the Thermal History Profile (Paul Thomas, Jaroslav Šesták, Klaus Heide, Ekkehard Füglein, and Peter Šimon)
20. Hotness Manifold, Phenomenological Temperature and Other Related Concepts of Thermal Physics (Jiří J. Mareš)
21. Historical Roots and Development of Thermal Analysis and Calorimetry (Jaroslav Šesták, Pavel Hubík, and Jiří J. Mareš)
5. Heat Transfer and Phase Transition in DTA Experiments (Pavel Holba, Jaroslav Šesták, and David Sedmidubský)
6. Determination of the Glass Transition by DSC: A Comparison of Conventional and Dynamic Techniques (John M. Hutchinson)
7. Structural Relaxation and Viscosity Behavior in Supercooled Liquids at the Glass Transition (Jiří Málek and Roman Svoboda)
8. Kinetics of Structural Relaxation in Glasses (Emília Illeková)
9. Kinetics of Crystal Nucleation in Closed Systems (Zdeněk Kožíšek, Pavel Demo, and Alexey Sveshnikov)
10. Influence of Preliminary Nucleation on the Physico-geometric Kinetics of Glass Crystallization (Nobuyoshi Koga and Jaroslav Šesták)
11. Application of Isoconversional Methods for the Processes Occurring in Glassy and Amorphous Materials (Peter Šimon and Paul S. Thomas)
12. Fractals in Solid-State Processes (Peter Šimon, Oldřich Zmeškal, and Jaroslav Šesták)
13. Crystallization of Metallic Micro-, Nano-, and Non-Crystalline Alloys (Emília Illeková and Jaroslav Šesták)
14. Crystallization Kinetics in Amorphous and Glassy Materials (Jiří Málek and Jana Šánělová)
15. Comments on DTA Methods for Estimation of Crystal Nucleation Rates in Glass-Forming Melts (Vladimir M. Fokin, Aluisio A. Cabral, Raphael M.C. Reis, and Edgar D. Zanotto)
16. Nonparametric Kinetic Methodsm (Julia Sempere, Rosa Nomen, Eduard Serra, and Bernat Sempere)
17. Electron Transport Studies of Disorder and Dimensionality in Nano-Crystalline Diamond (Pavel Hubík and Jiří J. Mareš)
18. Controlled Nucleation and Crystallization for Nanoparticle Synthesis (Isak Avramov and Christian Rüssel)
19. Nucleation on Strongly Curved Surfaces of Nanofibers (Pavel Demo, Alexey Sveshnikov, and Zdeněk Kožíšek)
20. Thermal Analysis of Waste Glass Batches: Effect of Batch Makeup on Gas-Evolving Reactions (David A. Pierce, Pavel Hrna, and José Marcial)
21. Amorphous Inorganic Polysialates: Geopolymeric Composites and the Bioactivity of Hydroxyl Groups (Jaroslav Šesták, Nobuyoshi Koga, Peter Šimon, Bronislav Foller, Pavel Roubíček, and Nae-Lih Wu)
22. Oxide Superconductors as Model Systems for Studying Phase Relations, Stoichiometry, Reaction Kinetics, and Unconventional Glass Formability (Takayuki Komatsu and Jaroslav Šesták)

Hot topics of thermal analysis, Volume 9 [17]

1. Some Fundamental and Historical Aspects of Phenomenological Kinetics in the Solid State Studied by Thermal Analysis (Nobuyoshi Koga, Jaroslav Šesták, and Peter Šimon)
2. Equilibrium Background of Processes Initiated by Heating and Ehrenfest's Classification of Phase Transitions (Pavel Holba)
3. Crystal Defects and Nonstoichiometry Contributions to Heat Capacity of Solids (Pavel Holba and David Sedmidubský)
4. Forty Years of the Turnbull Reduced Glass Transition Temperature and Hruby Glass-Forming Coefficient and Their Current Perception (Ana Kozmidis-Petrovic and Jaroslav Šesták)

The second book, Vol. 9 was officially christened during the 4th Joint Czech-Hungarian-Polish-Slovak International Thermoanalytical Conference in Pardubice, June 2013, by the Series Editor and the Chief-Editor of JTAC, Prof. Judit Simon, (in the middle of key authors and book editors, Prof. P. Šimon and Prof. J. Šesták)

A new open-access web site portal covering an extended range of thermophysical studies

Newly launched open-access web site portal is proposed to provide a service to a wider community of scientists in the various branches of thermal science including thermodynamics, thermochemistry, thermometry, thermal analysis, thermal physics, calorimetry as well as heat transfer problems (thermokinetics). In 1837, English polymath, scientists, priest, philosopher, theologian, and historian of science William Whewell (1794–1866) professor of Cambridge University, coined the word “*thermotics*” in his book [27], mentioning the part “*History of Thermotics and Atmology*,” by using the following sentence: “I employ the term *Thermotics* to include all the doctrines respecting *Heat*, which have hitherto been established on proper scientific grounds.” In 1967, American physical chemist Ralph Tykodi (1925–2009) made an attempt to revive the term thermotics [25, 26]. His aim, however, was to revive or redress the term thermotics to be a science composed of three sub-branches: *thermo-statics*, that pertaining to the classical equilibrium aspects of heat; *thermo-dynamics*, that pertaining to those aspects for which time variation is important; and *thermo-steadics*, that pertaining to aspects that are temporally steady or stationary. Our attempt to revive the term thermotics was born at searching for an English equivalent of the Czech word “*Teplozpyt*” (Wärmeforschung, Теплоиспытание, Thermoscopy, Recherche de chaleur). Our understanding of this Czech word is similar to the conception of W. Wheller, who included into thermotics the “doctrines” of heat transfer and as well as “doctrines” of specific and latent heat (as

accompanied to phase transitions), but extended mainly to the wide field of contemporary thermodynamics (including sub-branches proposed by R. Tykodi) and to the theory and practice of the various calorimetric and thermoanalytical methods and to the processing of their resulting measurement data. The portal <www.thermotics.eu> will present an assortment of easy downloadable contributions from historical and aged papers to recent publication (even those unaccepted by journals), books, reports, lectures, news, and societal information (photos including historical records, newscast, and events), etc. <thermotics.eu> should become a useful aid to the thermoanalytical venture depending on the cooperation and support of all. In the meantime the portal is linked with a personal web site <www.fzu.cz/~sestak> where several full-text free-downloadable book are available, such as:

- Thermodynamic applications concerning constrained states: Thermodynamic history, kinetic diagrams, glasses, phases characterization. Internal Report Book by the Institute of Physics (Academy of Sciences), 310 pp, 5 chapters, FZU, Prague 1990.
- Special Materials and Modern Technologies: processing theory, single-crystal-growth, organic semiconductors, magnetics, energy conversion; 688 pp in Czech, 12 multipart chapters, Academia, Praha 1993.
- Heat, thermal analysis and society, Nucleus 2004, 380 pp, 20 chapters (ISBN 80-86225-54-2).
- Abstract Thermodynamics: states, manipulation, space and special structures, 174 pp, 6 chapters by OPS Nymburk, Plzen 2006 (ISBN 80-239-6075-X).
- Thermal physics of structure of crystalline and non-crystalline materials, Pardubice 2008, 345 pp in Czech (ISBN 978-80-7395-023-1).
- Some thermodynamic, structural and behavioral aspects of materials accentuating noncrystalline states, OPS Plzeň 2009 with 610 pp, 28 chapters (ISBN 978-80-87269-06-0) and second addition 2011 (ISBN 978-80-87269-20-6).
- Selected topics of textile and material science, Liberec-Plzeň 2011, 404 pp, 31 chapters, (ISBN 978-80-261-0062-1).

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