Review

Thermal Analysis. Fundamentals and Applications. Kinetic Analysis of Heterogeneous Transformations, Authors: Eugen Segal, Petru Budrugeac, Oana Carp, Nicolae Doca, Crişan Popescu, Titus Vlase, Publishing House of the Romanian Academy, Bucharest, 2013, ISBN 987-973-27-2281-7

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The goal of this book published in Romanian language is to present an outline of the basic principles of non-isothermal kinetics, and to give a detailed grounding in the major methods of evaluation of non-isothermal kinetic parameters characteristic for a heterogeneous process. The authors keep into account the main conclusion of some recent papers, especially of ICTAC (*International Confederation for Thermal Analysis and Calorimetry*) 2000 Project (*Thermochimica Acta* 355 (2000) 125), the Workshop at ICTAC 13 (*Journal of Thermal Analysis and Calorimetry* 80 (2005) 795) and the recent ICTAC Kinetics Committee recommendations for performing kinetic computations on thermal analysis data (*Thermochimica Acta* 520 (2011) 1) , according to which the correct kinetic analysis of non-isothermal data corresponding to a heterogeneous process can be performed only by using the experimental data recorded at several heating rates.

Non-isothermal kinetic methods have been applied, critically discussed and investigated by authors for long period, and they summarized the experiences in this field completing them with their own results.

The book is divided into 11 chapters each followed by bibliographic references.

After a very brief overview of thermo-analytical methods, including multiple techniques (thermogravimetry (TG or TGA), differential thermal analysis (DTA), differential scanning calorimetry (DSC), thermo-magnetic analysis, thermo-optical analysis, thermo-dilatometric

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analysis (DIL), thermo-mechanical analysis (TMA), dynamic mechanical analysis (DMA), thermo-electrical analysis (TEA) , thermally stimulated exchanged gas analysis (EGA), simultaneous thermal analyses (STA)), there are presented and critical discussed the differential and integral methods of assessment of non-isothermal kinetic parameters by using a single conversion vs. temperature curve recorded at a heating rate. It is mentioned that a single conversion vs. temperature curve recorded at a certain heating rate can be satisfactory described by some different kinetic triplets (activation energy, pre-exponential factor and conversion function), and the inherent experimental errors determine the impossibility to discriminate the correct kinetic triplet by applying a statistical criterion. The overcoming of this problem could be performed by applying the isoconversional (model-free) methods in assessing the activation energy dependence on the conversion degree, which can be correlated with the investigated process mechanism. These methods (linear and non-linear) are exhaustively presented in two chapters.

The following special techniques and procedures used for evaluation of the kinetic parameters of heterogeneous processes are also presented and discussed: controlled rate thermal analysis (CRTA) techniques (quasi-isothermal analysis, quasi-isobaric analysis, thermal analysis at low pressure and controlled rate stepwise isothermal analysis) and modulated thermal analysis techniques (modulated DSC (MDSC) and modulated thermogravimetry (MTGA)), non-parametric kinetic method (NPK), and procedures for determination of kinetic model (conversion function) corresponding to a single step heterogeneous process. Finally, a general algorithm for evaluation of kinetic parameters using non-isothermal data is suggested.

Last chapter contains a general overview concerning the methods of kinetic parameters evaluation by using non-isothermal data. By surveying the most used methods for evaluating the kinetic parameters from non-isothermal experiments, a classification scheme of the methods is suggested. This classification is based on the number of principles and theoretical approximations required to derive the equation which grounds it.

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For a better understanding of the book content, the authors give a great number of drawings, diagrams, graphs and tables. The style of the text and the outlay are perfectly adequate to its goal. The book provides an up-to-date and comprehensive content to whole field of application of thermal analysis methods for kinetic analysis of non-isothermal data.

The book meets to requirements of specialists in chemical kinetics and chemical engineering, as well as those of students in chemistry, physics and chemical technology.