

Jürgen Troitzsch

Plastics Flammability Handbook

Principles, Regulations, Testing, and Approval



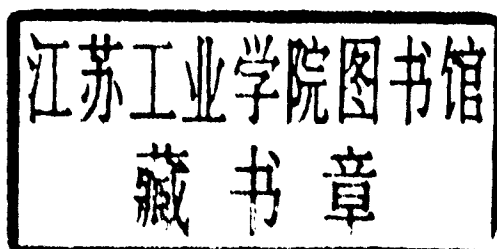
3rd Edition

HANSER

Plastics Flammability Handbook

Principles, Regulations,
Testing, and Approval
3rd Edition

Edited by Jürgen Troitzsch



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Dr. Jürgen Troitzsch, Adolfsallee 30, 65185 Wiesbaden, Germany

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Contributors List

Diplom-Physikerin Edith Antonatus
BASF AG
Aweta Brandschutztechnik
KTE/SB – A 521
D-67056 Ludwigshafen
Germany

Dr. Tamás Bánky
NPC for Quality Control and Innovation
in Building
Diószegi út 37
H-1113 Budapest
Hungary

Thierry Bonnaire
Formerly: CSTB
84, Avenue Jean Jaurès
Champs-sur-Marne
F-77421 Marne-La-Vallée
France

Prof. Dr. Serge Bourbigot
ENSCL
Cité Scientifique, Bâtiment C7
BP 108, F-59652 VilleneuveD'Ascq, CEDEX
France

Prof. Dr. Jean-Claude Brosse
Université du Maine
Laboratoire de Chimie et Physicochimie
Macromoléculaire
B.P. 35
F-72017 Le Mans
France

Prof. Dr. Joseph Davidovits
Institut Géopolymère
16 rue Galilée
F-02100 Saint-Quentin
France

Dr. Daniel Derouet
Université du Maine
Laboratoire de Chimie Organique Macro-
moléculaire
Avenue Olivier Messiaen
F-72085 Le Mans Cedex 9
France

Prof. Dr. Colomba Di Blasi
Università degli Studi di Napoli
“Federico II”
Dipartimento di Ingegneria Chimica
P. le V. Tecchio
I-80125 Napoli
Italy

Vincent P. Dowling
CSIRO Manufacturing and Infrastructure
Technology
Fire Science & Technology Laboratory
PO Box 56
Highett, Victoria 3190
Australia

Dr. Axel Ebenau
BASF Future Business GmbH
Rathausplatz 10
D-67059 Ludwigshafen
Germany

Dr. Thomas Eckel
Bayer Polymers
Innovation - Polymer Alloys
D-41538 Dormagen
Germany

Dr. Jadwiga Fangrat
Building Research Institute
Fire Research department
Filtrowa 1
00-611 Warsaw
Poland

Dr. Uwe Fink
SRI Consulting
Katharinenweg 7
CH-8002 Zürich
Switzerland

Santiago Garcia Alba (deceased)
LICO/AFITI
Ctra. Valencia Km 23,400
E-28500 Arganda del Rey
Madrid
Spain

Dr. Ondrej Grexa
State Forest Products Research Institute
Dubravská Cesta 1
83330 Bratislava
Slovakia

Hartmut Grupp
Allianz Zentrum für Technik
Krausstraße 22
85737 Ismaning
Germany

Dr. Patrick van Hees
SP – Swedish National Testing & Research
Institute
Dept. of Fire Technology
P.O. Box 857
S-50115 Borås
Sweden

Rüdiger Hoffmann
Swiss Institute of Safety and Security
Nüscherstrasse 45
CH-8001 Zurich
Switzerland

Prof. Dr. A. Richard Horrocks
Bolton Institute
Deane Road
Bolton, BL3 5AB
UK

Dr. Baljinder K. Kandola
Bolton Institute
Deane Road
Bolton, BL3 5AB
UK

Dr. Björn Karlsson
Icelandic Fire Authority
Skulagata 21
101 Reykjavik
Island

Ir. Mathijs F.M. Koppers
GE Plastics bv
1 Plasticlaan PO Box 117
NL-4600 AC Bergen op Zoom
The Netherlands

Dr. Michel Le Bras
ENSCL
Cité Scientifique, Bâtiment C7
BP 108, F-59652 Villeneuve D'Ascq,
CEDEX
France

Dr. Sergei V. Levchik
Akzo Nobel Chemicals Inc.
1 Livingstone Ave.
Dobbs Ferry, NY 10522
USA

Dr. Maryline Lewandowski
GEMTEX
ENSAIT
9, rue de l'Ermitage BP 30329
F-59056 Roubaix
France

Dr. Christine Lukas
Dow Construction Products
2 Heathrow Boulevard
284 Bath Road
West drayton
Middlesex UB7 0DQ
England

Dr. Michael A. McKinney
Marquette University
Department of Chemistry
P. O. Box 1881
Milwaukee, WI 53201
USA

Dr. Jim Mehaffey
Forintek Canada Corp.
Suite 4100 CTTC
1125 Colonel By Drive
Ottawa, Ontario K1S 5R1
Canada

Silvio Messa
LSF Srl – Laboratorio di Studi e Ricerche
sul Fuoco
Via Garibaldi 28a
I-22070 Montano Lucino (Como)
Italy

Dr. Michael Mitzlaff
Siemens Axiva GmbH
Brandhaus Hoechst
Industriepark Hoechst - C 369
D-65926 Frankfurt
Germany

Dipl.-Ing. Berthold Müller
Bayer AG
Bayer Industry Services
SUA-SPA-Brandtechnologie
Geb. 411
D-51368 Leverkusen
Germany

Janet Murrell
Warrington Fire Research Centre Ltd.
Holmesfield Road
Warrington
Cheshire WA1 2DS
UK

Dr. Keith Paul
9, Birch Drive
Shawbury, Shrewsbury
Shropshire SY4 4HZ
UK

Prof. Dr. Jürgen Pauluhn
Bayer HealthCare / Toxicology Build. 514
D-42096 Wuppertal
Germany

Dipl.-Ing. Dr. Christian Pöhn
MA 39 Versuchs- und Forschungsanstalt der
Stadt Wien
Rinnböckstrasse 15
A-1110 Wien
Austria

Prof. Dr. Dennis Price
Salford University
Cockroft Building
Fire Chemistry Research Group
Salford M5 5WT
UK

Jian-Min Qian
Sichuan Fire Research Institute
266 Waibei Street
Dujiangyan City
Sichuan Province, 611830
China

Dr. Kurt A. Reimann
BASF Corporation
1419 Biddle Avenue
Wyandotte, MI, 48192
USA

Dr. Maryline Rochery
GEMTEX
ENSAIT
F-59056 Roubaix
France

Dr. Herman Stone
115 Cimarand Dr
Williamsville, NY 14221
USA

Björn Sundström
SP – Swedish National Testing & Research
Institute
Dept. of Fire Technology
P.O. Box 857
S-50115 Borås
Sweden

Guy Touchais
Formerly: CSTB
84, Avenue Jean Jaurès
Champs-sur-Marne
F-77421 Marne-La-Vallée
France

Dr. Jürgen Troitzsch
Fire Protection Service
Adolfsallee 30
D-65185 Wiesbaden
Germany

Dr. Heinz Ulrich Werther
Dr. Hans Hoffmann Strasse 12
D-67157 Wachenheim
Germany

Prof. Dr. Charles A. Wilkie
Marquette University
Department of Chemistry
P. O. Box 1881
Milwaukee, WI 53201
USA

Prof. Dr.-Ing. Friedrich-Wilhelm Wittbecker
Bergische Universität Wuppertal
Fachbereich 14 Sicherheitstechnik
Brand- und Explosionsschutz
Gaußstraße 20
D-42119 Wuppertal
Germany

Koichi Yoshida
National Maritime Research Institute, Japan
(NMRI)
6-38-1 Shinkawa
Mitaka City
Tokyo 181-0004
Japan

Dr. Roman Zoufal
Bulharská 38/1401
10100 Prague 10
Czech Republic

Preface to the Third Edition

None of the many publications on the reaction of plastics to fire provides a comprehensive review of the fundamentals as well as of the relevant regulations and test methods. The “International Plastics Flammability Handbook” was first published in 1983 to fill this gap. In the 1980s, major changes occurred in the field of plastics fire behavior ratings on national and increasingly on international levels. These changes made it necessary to prepare a completely revised 2nd edition of the handbook, which was published in 1990. The last thirteen years saw a breakthrough in the internationalization of fire testing and classification, particularly in building, electrical engineering, and transportation. At the same time, the perception of how to assess the main parameters governing a fire and the role of combustible materials like plastics were redefined and led to new approaches particularly in the fields of smoke development and toxicity of fire effluents. All these developments required a comprehensive revision of the handbook.

To fulfill these demands, the various chapters were revised by experts in the relevant fields. I should like to express my gratitude to my responsible editors *M. Le Bras* and *S. Bourbigot* (I Fundamentals), *M. Mitzlaff* (II Fire protection regulations and test procedures), *H. U. Werther* (III Fire effluents) and to the more than 40 co-authors, whose expertise and commitment made the revision of this handbook feasible.

The handbook consists of four parts: After a historical review and a detailed synopsis of the market situation, Part I describes the basic principles of the burning process, covers the thermal properties and burning behavior of thermoplastics, foams, thermosets, and elastomers in depth. Chapters on flame retardants, their mode of action and flame retardant plastics, the burning behavior of textiles and flame retardant textiles, smoke development and suppression follow. It is hoped that this will facilitate the reader’s introduction to this complex subject and also provide the background to a better understanding of the fire test procedures, regulations, and approval criteria covered in the second part.

Part II starts with an introduction to the methodology of fire testing and describes fire protection regulations, the fire test methods introduced to satisfy these regulations, and product approval procedures for combustible products and plastics components in various applications.

The most extensive section in the handbook is devoted to the building sector for which numerous regulations and test methods were developed in all industrialized countries and where a tremendous harmonization effort is under way or was already completed.

Further sections cover transportation and electrical engineering where international harmonization of regulations and test methods has made greater progress. Their number and variety is thus less extensive. The chapter on furnishings focuses on developments in the European Union and the US.

Part III deals with the smoke development, toxicity, and corrosivity of fire effluents. These topics are of increasing public interest and thus covered in some depth.

Part IV, the Appendix, contains listings intended to assist the reader in his daily work.

It is hoped that this book will be of interest to all those concerned with plastics, flame retardancy, fire testing as well as fire protection and will help to better understand this complex matter.

Jürgen Troitzsch

How to use this book

Structure

The book commences with an historical synopsis on the topic of fires and an account of the present situation in fire protection. The market situation for plastics and flame retardants is covered in some depth. Subsequently the basic principles of the burning process and the combustion of individual plastics are considered. The thermal properties and burning behavior of plastics and textiles are examined in the light of the physical and chemical processes taking place. Methods of rendering plastics and textiles flame retardant and reducing smoke emissions are covered and the modes of action of flame retardants and smoke suppressants are explained.

Part II begins with an introduction to the methodology of fire testing followed by discussion of national and international fire protection regulations and test methods for combustible materials and plastics. Building fire protection occupies the largest part of the book and is arranged according to a uniform scheme for all 20 countries, the European Union and ISO dealt with in Chapter 10. Each section for the respective country commences with an account of the statutory regulations and continues with a summary of the relevant test methods in the form of diagrams and tables of test specifications. The reader is thus able to grasp the essentials at a glance. Further details should be taken from the original standards listed in the bibliography at the end of each section.

Officially recognized test institutions and procedures for obtaining official product approval are listed under the heading "Official approval". Each section ends with a look at future developments in the relevant country.

Chapters 11 to 13 are arranged in a similar fashion except that the divisions are according to subject rather than country.

Fire effluents are dealt with together for the sake of clarity in Part III in Chapters 14 to 17. Chapter 15 "Smoke development of fire effluents" thus contains all the test methods relevant to building, transportation and electrical engineering. Chapter 16 covers the basics of the toxicity of fire effluents and testing principles; Chapter 17 deals with corrosivity assessment methods and the practice of clean-up procedures of fire effluents.

Part IV "Appendix" contains various lists including a suppliers' index for flame retardants and smoke suppressants, addresses of standards and electrical engineering organizations. The glossary of technical fire protection terminology and the English, German, and French equivalents of the most important terms will be extremely useful to workers in the field. The Appendix closes with a list of all the standards and guidelines mentioned in the book and a comprehensive name and subject index.

References

A bibliography can be found at the end of each chapter and the principal journals and books on the subject are listed in the Appendix.

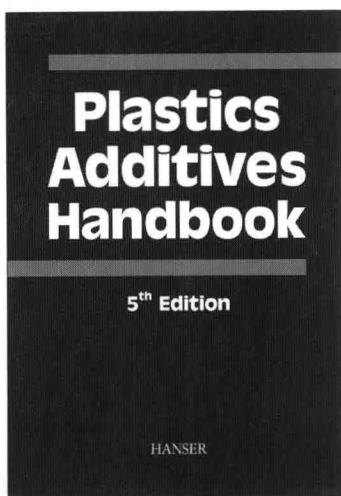
Illustrations and tables

Illustrations and tables are numbered consecutively in each chapter. Diagrams of test equipment include only those features necessary for understanding the method.

The tables of test specifications summarize details of test specimens, specimen position, ignition source, test duration and conclusions.

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All About Additives.



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