

Linda Makovicka Osvaldova  
Frank Markert  
Samuel L. Zelinka *Editors*

# Wood & Fire Safety

Proceedings of the 9th International  
Conference on Wood & Fire Safety 2020



9th International Scientific Conference

wood & fire  
safety 2020

May 3-6, 2020 | The Hotel Patria | Strbske Pleso | Slovakia



Springer

# Wood & Fire Safety

Linda Makovicka Osvaldova ·  
Frank Markert · Samuel L. Zelinka  
Editors

# Wood & Fire Safety

Proceedings of the 9th International  
Conference on Wood & Fire Safety 2020

 Springer



9th International Scientific Conference

**wood & fire  
safety 2020**

May 3-6, 2020 | The Hotel Patria | Strbske Pleso | Slovakia

*Editors*

Linda Makovicka Osvaldova  
Department of Fire Engineering  
Faculty of Security Engineering  
University of Zilina  
Zilina, Slovakia

Frank Markert  
Department of Civil Engineering  
Technical University of Denmark  
Lyngby, Denmark

Samuel L. Zelinka  
USDA Forest Service  
Forest Products Laboratory  
Madison, WI, USA

ISBN 978-3-030-41234-0      ISBN 978-3-030-41235-7 (eBook)  
<https://doi.org/10.1007/978-3-030-41235-7>

© Springer Nature Switzerland AG 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Foreword

Dear Wood & Fire Safety 2020 participants.

It is an honour for us to welcome you to Slovakia at the Hotel Patria in Strbske Pleso for the 9th International Scientific Conference Wood & Fire Safety 2020 (WFS 2020).

The traditional meeting of experts in the field of fire protection who prefer wood and wood-based materials, is held at regular four-year intervals since its origin in the year 1988.

All the conferences have been held at this traditional venue - the hotel Patria in Strbske Pleso, Slovakia. Since that first event up until the last one in the year 2016, the Conference has hosted more than 750 participants, of which 224 were internationals.

The regular conference participants are not only delegates from the European countries but from non - European countries as well, mostly from Canada, U.S., New Zealand, Australia, Japan, and in recent years, also from China.

The aim of the WFS 2020 conference is to gather at one place new knowledge of this multidisciplinary field, namely the combustion of solid materials, modelling, measuring, testing of flammability, structure and properties of wood and their changes at high temperatures, the study of stages of the wood burning process, flame-retardant treatment of wood and wood-based materials, fire safety in wooden buildings, fire-fighting in wooden buildings, forest fires, fire-fighting in a historical building, and others.

This year WFS2020 has attracted about 65 papers from all over the world including Australia, Canada, China, India, Japan, New Zealand, UK, U.S., Russia and Europe.

The proceeding has been subdivided into the following sections:

- Structure and properties of wood and its changes at high temperatures
- Wood burning retardation and wood-based materials
- Fire modelling, fire testing, fire certification, fire investigation, fire dynamic, fire behaviour modelling, smoke control and combustion toxicity
- Fire safety in wooden buildings

- Forest fires
- Others topics that focus on wood & fire safety

The chairman of WFS2020 would like to thank the reviewers and authors for their contribution of the papers and posters and all participants for their effort, trust and team-work during, as well as in the preparation phase of the conference.

The chairman of WFS2020 also expresses sincere acknowledgement and appraisal to the conference' sponsors, partners and media partners whose support and contributions were remarkable and without whom this conference would not be possible.

Last, but not least our enormous gratitude and recognition goes to the main organizers and co-organizers, whose dedication and enthusiasm made the WFS 2020 edition an unforgettable experience.

Strbske Pleso, Slovakia  
May 2020

Linda Makovicka Osvaldova  
Chairman Wood & Fire Safety 2020

# Preface

The Wood & Fire Safety 2020 proceedings present the latest results of scientific research in the field of combustion of wood and wood-based materials. Since this research topic involves so many aspects and disciplines, for a more detailed analysis of the issue we have divided it into six separate sections: Structure and properties of wood and its changes at high temperatures; Wood burning retardation and wood-based materials; Fire modelling, fire testing, fire certification, fire investigation, fire dynamic, fire behaviour modelling, smoke control and combustion toxicity; Fire safety in wooden buildings; Forest fires; Others topics that focus on wood & fire safety.

The Wood & Fire Safety 2020 proceedings encompasses the latest results of research papers in 65 scientific articles presented at the conference in the form of a lecture and 22 abstracts presented at the conference by a poster presentation. 242 authors from 32 countries participated in these researches. The papers (articles) have been a subject to a peer review process.

Strbske Pleso, Slovakia  
May 2020

Linda Makovicka Osvaldova  
Chairman Wood & Fire Safety 2020

# Organization

## Chairman of Wood & Fire Safety 2020

Linda Makovicka Osvaldova      University of Zilina, Slovakia

## Programme Chairs

Anthony Abu	University of Canterbury, New Zealand
Zakiah Ahmad	Universiti Teknologi Mara, Malaysia
Ladislav Andrisek	Fire Research Institute, Ministry of Interior of the Slovak Republic, Slovakia
Noureddine Benichou	National Research Council, Canada
Daniel Brandon	RISE, Sweden
Emilio Chuvieco	University of Alcalá, Spain
Steve Craft	CHM Fire Consultants, Canada
Christian Dagenais	FPInnovations, Canada
Dhionis Dhima	CSTB, France
Bogdan Dlugogorski	Murdoch University, Australia
Andrew Dunn	Timber Development Association, Australia
Massimo Fragiaco	University of L'Aquila, Italy
Milan Gaff	Czech University of Life Sciences, Czech Republic
Wojciech Grzeskowiak	Poznan University of Life Sciences, Poland
Lidia Gurau	Transilvania University of Brasov, Romania
Yuji Hasemi	Waseda University, Japan
Jaroslav Holusa	Czech University of Life Sciences, Czech Republic
Agnes Iringova	University of Zilina, Slovakia
Alar Just	Tallinn University of Technology, Estonia
Danica Kacikova	Technical University in Zvolen, Slovakia
Koji Kagiya	Building Research Institute, Japan



Jaroslav Kapusniak	Regional Headquarters of Fire and Rescue Services, Zilina, Slovakia
Michael Klippel	ETH Zurich, Switzerland
Yuriy Klyuchka	National University of Civil Defence, Ukraine
Venkatesh Kodur	Michigan State University, USA
Mirjana Laban	University of Novi Sad, Serbia
Antonin Lokaj	VSB - Technical University of Ostrava, Czech Republic
Andrea Majlingova	Technical University in Zvolen, Slovakia
Frank Markert	Technical University Denmark, Denmark
Iveta Markova	University of Zilina, Slovakia
Jozef Martinka	Slovak University of Technology in Bratislava, Slovakia
Birgitte Messerschmidt	NFPA, USA
Andrzej Mizerski	Main School of Fire Service, Poland
Robert Nemeth	University of Sopron, Hungary
Jiri Pokorny	VSB - Technical University of Ostrava, Czech Republic
Peter Rademacher	Eberswalde University, Germany
Agoston Restas	National University of Public Service, Hungary
Gervais Sawyer	International Wood Products Journal, UK
Joachim Schmid	ETH Zurich, Switzerland
Javier R. Sotomayor Castellanos	Michoacan University, Mexico
Jozef Svetlik	University of Zilina, Slovakia
Luigi Todaro	University of Basilicata, Italy
Matsagar Vasant	Indian Institute of Technology (IIT) Delhi, India
Pavlin Vitchev	University of Forestry, Bulgaria
Felix Wiesner	University of Edinburgh, UK
Qiang Xu	Nanjing University of Science and Technology, China

### **Steering Committee**

Jaroslav Flachbart	University of Zilina, Slovakia
Michaela Horvathova	University of Zilina, Slovakia
Juraj Jancik	University of Zilina, Slovakia

## Conference Organizers



## Conference Co-organizers



## Partners



## Sponsors

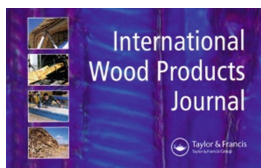


**STÖBICH®**



**PALONOT**  
RELIABLE PARTNER

## Media



**Drevársky  
magazín**

Odborný časopis na podporu drevárskej a nábytkárskej výroby



**iMateriály**

# Contents

<b>Structure and Properties of Wood and Its Changes at High Temperatures</b>	
<b>Small Scale Test to Measure the Strength of Adhesives at Elevated Temperatures for Use in Evaluating Adhesives for Cross Laminated Timber (CLT) . . . . .</b>	<b>3</b>
Samuel L. Zelinka, Byrne Miyamoto, Nathan J. Bechle, and Douglas Rammer	
<b>Experimental Study of the Combustion of a Single Biomass Particle . . .</b>	<b>9</b>
Pahola Acevedo, Angel Martinez, Corine Lacour, and Alexis Coppalle	
<b>Study of Selected Fire Characteristics of Beech Wood Depending on Particle Size . . . . .</b>	<b>16</b>
Richard Kuracina, Zuzana Szabová, and Karol Balog	
<b>Characterization of Wood Chemical Changes Caused by Pyrolysis During Flaming Combustion Using X-Ray Photoelectron Spectroscopy . . . . .</b>	<b>22</b>
Laura E. Hasburgh, Donald S. Stone, Samuel L. Zelinka, and Nayomi Z. Plaza	
<b>Initiation Parameters of Wood Based Materials . . . . .</b>	<b>28</b>
Peter Rantuch, Jozef Martinka, and Igor Wachter	
<b>Odor and FT-IR Analysis of Chemical Species from Wood Materials in Pre-combustion Condition . . . . .</b>	<b>35</b>
Kyoko Kamiya and Osami Sugawa	
<b>Effect of Thermal Load on the Heat Release Rate of the Selected Types of Wooden Floorings . . . . .</b>	<b>41</b>
Linda Makovicka Osvaldova and Michaela Horvathova	

<b>Toxic Gas Emissions from Plywood Fires</b> .....	50
Bintu Grema Mustafa, Miss H. Mat Kiah, Gordon E. Andrews, Herodotos N. Phylaktou, and Hu Li	
<b>Ignition of Wood Dust of African Padauk (<i>Pterocarpus Soyauxii</i>)</b> .....	58
Miroslava Vandličková and Iveta Marková	
<b>Experimental Study on Odor from Combustible Wood Materials in Their Pre-fire Situation in House</b> .....	66
Osami Sugawa and Kyoko Kamiya	
<b>The Impact of Radiant Heat on the Flexural Strength and Impact Strength in Spruce Wood Bending</b> .....	72
Anton Osvald and Jaroslava Štefková	
<b>Wood Burning Retardation and Wood-Based Materials</b>	
<b>Fire Retardancy and Leaching Resistance of Pine Wood Impregnated with Melamine Formaldehyde Resin <i>in-Situ</i> with Guanyl-Urea Phosphate/Boric Acid</b> .....	83
Chia-feng Lin, Olov Karlsson, George I. Mantanis, Dennis Jones, and Dick Sandberg	
<b>Application of a Bio-Based Coating for Wood as a Construction Material: Fire Retardancy and Impact on Performance Characteristics</b> .....	90
Stephanie Rensink, Michael F. Sailer, Roy J. H. Bulthuis, and Mieke A. R. Oostra	
<b>Fire Retardant Treatment of Wood – State of the Art and Future Perspectives</b> .....	97
Philipp Sauerbier, Aaron Kilian Mayer, Lukas Emmerich, and Holger Militz	
<b>Fire Behavior of Bamboo, <i>Guadua angustifolia</i></b> .....	103
Laia Haurie, Alina Avellaneda, and Joaquin Monton	
<b>The Study of Various Factors Influencing the Fire Retardant Efficiency of Wood Varnish</b> .....	109
Tatyana Eremina, Irina Kuznetsova, and Lyubov Rodionova	
<b>Flammability and Tribological Properties of Pine Sapwood, Reinforced with Sodium Metasilicate and Non-food Oil</b> .....	114
Edita Garskaite, Dalia Brazinskiene, Svajus Asadauskas, Lars Hansson, and Dick Sandberg	
<b>Expandable Graphite Flakes as an Additive for a New Fire Retardant Coating for Wood and Cellulose Materials – Comparison Analysis</b> .....	120
Batista Anielkis, Grześkowiak Wojciech, and Mazela Bartłomiej	

<b>Research of Effectiveness of Wood Fire Protection by Modified Epoxy Polymers</b> .....	125
Oleksandr Hryhorenko, Nataliia Saienko, Volodymyr Lypovyi, and Serhii Harbuz	
<b>The Study of the Complex of Properties of Water-Dispersion Fire Retardant Paint for Wooden Structures</b> .....	129
Tatyana Eremina, Dmitry Korolchenko, and Irina Kuznetsova	
<b>Fire Modeling, Fire Testing, Fire Certification, Fire Investigation, Fire Dynamic, Fire Behaviour Modelling, Smoke Control and Combustion Toxicity</b>	
<b>Pine Wood Crib Fires: Toxic Gas Emissions Using a 5 m<sup>3</sup> Compartment Fire</b> .....	137
Bintu G. Mustafa, Rosmawati Zahari, Yangfu Zeng, Miss H. Mat Kiah, Gordon E. Andrews, and Herodotos N. Phylaktou	
<b>Comparison of Cone Calorimetry and FDS Model of Low-Density Fiberboard Pyrolysis</b> .....	144
Juraj Jancík, Paulína Magdolenová, and Frank Markert	
<b>Behaviour of Timber Doors in Fire Conditions</b> .....	152
Bartłomiej Sędlak, Paweł Sulik, and Daniel Izydorczyk	
<b>Charring of Timber with Fissures in Experimental and Numerical Simulations</b> .....	159
Jaroslav Sandanus, Zuzana Kamenická, Peter Rantuch, Jozef Martinka, and Karol Balog	
<b>A Parametric Study of Numerical Modelling of Water Mist Systems in Protection of Wood Frame Buildings</b> .....	166
Nour Elsagan and Yoon Ko	
<b>Evaluation of Structural Elements Affected by Fire</b> .....	173
Jan Bujnak and Abdelhamid Bouchair	
<b>Study of the Heat and Mass Transfer in Special Furnaces During Fire Resistance Tests of Building Construction</b> .....	179
Oleksandr Nuianzin, Dmytro Kryshstal, Oleh Zemlianskyi, Artem Nesterenko, and Taras Samchenko	
<b>Experimental and Numerical Analysis of Fire Development in Compartment Fires with Immobile Fire Load</b> .....	185
Sven Brunkhorst and Jochen Zehfuß	
<b>Behaviour of Wooden Materials Exposed to Electrical Ignition Sources</b> .....	191
Miroslava Nejtková	

<b>Feasibility Study of Correlating Mass Quantity Output and Fuel Parameter Input of Different Simulations Using Fire Dynamics Simulator</b> .....	197
Steffen Oliver Sæle	
<b>Thermography of Wood-Base Panels During Fire Tests in Laboratory and Field Conditions</b> .....	203
Denis Kasymov, Mikhail Agafontsev, Pavel Martynov, Vladislav Perminov, Vladimir Reyno, and Egor Golubnichiy	
<b>Fire Safety in Wooden Objects</b>	
<b>Issues and Solutions for Compartments with Exposed Structural Mass Timber Elements</b> .....	213
David Barber, Robert Dixon, Susan Deeny, and Pascal Steenbakkers	
<b>Australian Building Code Change - Eight-Storey Timber Buildings</b> . . .	219
Paul England and Boris Iskra	
<b>A Case Study Comparing the Fire Risk in a Building of Non-combustible Frame and a Timber Frame Building</b> .....	226
Bjorn Karlsson, Iris Gudnadottir, and Bodvar Tomasson	
<b>Overview of North American CLT Fire Testing and Code Adoption</b> . . .	232
Samuel L. Zelinka, Laura E. Hasburgh, and Keith J. Bourne	
<b>From Low-Rise to High-Rise Buildings: Fire Safety of Timber Frame Facades</b> .....	238
Anton Kraler, Clemens Le Levé, Thomas Badergruber, and Michael Flach	
<b>Experimental Study on Fire Resistance of One-Way Straight and Through Mortise-Tenon Timber Joints</b> .....	244
Lingzhu Chen, Qingfeng Xu, Chongqing Han, Xi Chen, Xiaofeng Hu, and Zhengchang Wang	
<b>Fire Performance of CLT Members: A Detailed Review of Experimental Studies Across Multiple Scales</b> .....	251
Christos Kontis, Christoforos Tsihclas, Dionysios I. Kolaitis, and Maria A. Founti	
<b>Building Envelope Material Solutions for the Timber Structures Intended for Housing and Accommodation in Terms of Fire Safety, Fire Progression, and Consequences of Fire</b> .....	258
Agnes Iringová	
<b>Fire Design Model for Timber Frame Assemblies with Rectangular and I-Shaped Members</b> .....	268
Katrin Nele Mäger, Mattia Tiso, and Alar Just	

<b>Proposal of Changes in Fire Safety Assessment for Extending the Usability of Wood in Buildings</b> . . . . .	275
Petr Kučera, Isabela Bradáčová, Jiří Pokorný, and Tereza Česelská	
<b>Behavior of Bamboo Wall Panel at Elevated Temperature</b> . . . . .	281
Anu Bala, Ashish Kumar Dash, Supratic Gupta, and Vasant Matsagar	
<b>Study of Thermal Exposure of a Seat of Fire Inside a Building with a Façade Fabricated of Timber Materials on the Construction Elements of Adjacent Facilities</b> . . . . .	288
Vadym Nizhnyk, Serhii Pozdieiev, Yurii Feshchuk, Olexander Dotsenko, and Volodymyr Borovykov	
<b>Traditional Log Cabin – Exterior Log Wall – Fire Characteristics and Prediction Using Analysis of Thermos-Technical Properties</b> . . . . .	295
Stanislav Jochim, Linda Makovicka Osvaldova, and Martin Zachar	
<b>Impact of Bolt Pattern on the Fire Performance of Protected and Unprotected Concealed Timber Connections</b> . . . . .	303
Aba Owusu, Osama (Sam) Salem, and George Hadjisophocleous	
<b>Effect of Thermal Loading on Various Types of Wood Beams</b> . . . . .	311
Stanislava Gašpercová and Miroslava Vandlíčková	
<b>A Study of the Fire Performance of Timber-Walled Compartments</b> . . . . .	318
Avishek Chanda, Swagata Dutta, and Debes Bhattacharyya	
<b>Research of Wooden Bearing Structures Behavior Under Fire Condition with Use Advanced Methods of Fire Resistance Calculation Considering Eurocode 5 Recommendation</b> . . . . .	326
Serhii Pozdieiev, Stanislav Sidnei, Olha Nekora, and Svitlana Fedchenko	
<b>Forest Fires</b>	
<b>Experimental Studies of the Localization of Combustion of Forest Fuel Material Using a Water Barrier Line</b> . . . . .	335
Geniy V. Kuznetsov, Ivan S. Voitkov, Roman S. Volkov, Yuliana K. Atroshenko, and Pavel A. Strizhak	
<b>Measuring the Impact of Fire Occurrence Risk on the Value of Forest Land at Growing Scots Pine (<i>Pinus sylvestris</i>, <i>L.</i>) and European Beech (<i>Fagus sylvatica</i>, <i>L.</i>) Stands in the Territory of Slovak Paradise</b> . . . . .	341
Ján Holécý and Michaela Korená Hillyayová	
<b>Analysis of the Existence of Geospatial Data Necessary for Fire Modeling in the Republic of Serbia</b> . . . . .	347
Marko Marković, Mirjana Laban, Jovana Maksimović, Tatjana Kuzmić, Mehmed Batilović, and Suzana Draganić	



<b>Numerical Modeling of the Process of Thermal Impact of Wildfires on Buildings Located Near Forests</b> .....	354
Valeriy Perminov	
<b>Method for Stand Flammability Classification</b> .....	361
Miroslaw Kwiatkowski, Ryszard Szczygieł, and Bartłomiej Kołakowski	
<b>Hungarian - Slovakian Cooperation Making Aerial Firefighting More Effective: Error Analysis</b> .....	367
Agoston Restas	
<b>Comparison of the Effectiveness of Selected Indicators Classifying Burnt Areas on the Basis of Low Altitude Measurements</b> .....	374
Anna Szajewska	
<b>Vegetation Fire Behavior Prediction in Russia</b> .....	379
Aleksandra V. Volokitina, Tatiana M. Sofronova, and Mikhail A. Korets	
<b>Use of Aviation Technology in Forest Fire Fighting in Slovakia</b> .....	386
Kamil Matta	
<b>Others Topics Focus on Wood &amp; Fire Safety</b>	
<b>Fire Protection of Steel Beams by Timber: Thermomechanical Analysis</b> .....	397
Antoine Bérezyiat, Maxime Audebert, Sébastien Durif, Abdelhamid Bouchaïr, Amir Si Larbi, and Dhionis Dhima	
<b>Water Mist Systems in Protection of Mass Timber Buildings</b> .....	404
Yoon Ko, Max Kinateder, and Nour Elsagan	
<b>Pyrolysis of Wood Biomass to Obtain Biochar and Its Subsequent Application</b> .....	410
Petra Roupčova, Karel Klouda, and Simona Slivkova	
<b>Wood as Fire Protection of Steel in Hybrid Structural Elements</b> .....	420
Véronique Saulnier, Sébastien Durif, Salah Oulboukhitine, Abdelhamid Bouchaïr, and Gisèle Bihina	
<b>Electric Cables Installed in OSB Boards Surfaces and Their Temperature</b> .....	426
Jozef Martinka, Peter Rantuch, Tomáš Štefko, and Igor Wachter	
<b>Improvement of Fire Response Efficiency by Means of Reducing the Time of Initial Fire Detection</b> .....	432
Yuriy Klyuchka, Kostiantyn Afanasenko, and Khalid Hasanov	
<b>Assessment of Makeshift Technical Devices Used for Caving and Backfilling</b> .....	438
Monika Šullová and Milan Konárik	

<b>Experimental Evaluation of the Effectiveness of the Use of Thermal Imagers in Fires Extinguishing with the Presence of Wooden Combustible Substances</b> .....	445
Yuriy Klyuchka, Kostiantyn Afanasenko, and Khalid Hasanov	
<b>Poster Abstracts</b>	
<b>The Impact of Material Solutions on Fire Safety of Timber Frame Structures</b> .....	453
Paweł Sulik and Bartłomiej Sędkak	
<b>Properties of Flammable Materials in Passenger Cars Describing Their Fire Behavior</b> .....	454
Petra Bursíková, Romana Friedrichová, Libor Ševčík, Milan Růžička, and Jan Karl	
<b>Experimental Study of the Combustion of a Single Biomass Particle</b> ...	455
Acevedo Pahola, Angel Martinez, Lacour Corine, and Coppalle Alexis	
<b>Research on Electrical Fault Beads Ignition Ability-a Potential Source of Wildland Fires</b> .....	456
Huifei Lü, Jun Deng, Lei Bai, Weifeng Wang, and Jingyu Zhao	
<b>Heat Flux from Wood Filled Transport Package Impact Limiter Under Fire Conditions</b> .....	457
Martin Feldkamp, Marina Erenberg, Marko Nehrig, Claus Bletzer, André Musolff, and Frank Wille	
<b>Gaseous and Particulate Emissions of a Feed-Pellet Domestic Boiler</b> ...	459
Angel Martinez, Corine Lacour, Jérôme Yon, and Alexis Coppalle	
<b>Study on Design Fire Protection Elements in Wooden Facades</b> .....	460
María Pilar Giraldo, Ana María Lacasta, and Andreu Segura	
<b>Evaluation of the Link Between Pre-fire Fuel Estimates and Fire Radiative Energy for Large Fires in Portugal</b> .....	461
Célia M. Gouveia, Catarina Alonso, and Patrícia Páscoa	
<b>Reduction of Flammability of Synthetic and Natural Composite Materials Based on Formaldehyde-Containing Bonding Agents</b> .....	462
Anatolii Chernov, Andrey Shmakov, Oleg Korobeinichev, Munko Gonchikzhapov, and Valeriy Tatarenko	
<b>Components Decisive for the Failure of Chosen Fireproof Separating Elements</b> .....	463
Daniel Izydorczyk, Bartłomiej Sędkak, and Paweł Sulik	
<b>Flame-Retardant and Smoke-Suppressed Silicone Foams with La/Mg/Zn/al Layered Double Hydroxide and Zinc Borate</b> .....	464
Furu Kang, Jun Deng, and Jingyu Zhao	

<b>New Method for Mineralization of Wood for Improved Fire Properties</b> .....	465
Andreja Pondelak, Rožle Repič, Tomaž Pazlar, Nataša Knez, Friderik Knez, and Andrijana Sever-Škapin	
<b>Fire Properties of Beech Wood Mineralized by a Novel Mineralization Technique</b> .....	467
Rožle Repič, Andreja Pondelak, Nataša Knez, Friderik Knez, and Andrijana Sever-Škapin	
<b>Flammable Load as a Trigger of Fire After a Road Accident Resulting in Death from Burning</b> .....	468
Martin Skripko	
<b>Influence of the Convection Coefficient for the Modelisation of a Fire Test on a Nuclear Transport Package</b> .....	469
Norma Verbrugge, Gaël Desroches, Marianne Moutarde, and Florence Gauthier	
<b>Establishment of Local-Scale Weather Forcing Conditions to Iberia's Largest Fires</b> .....	470
Inês Vieira, Ana Russo, Ricardo M. Trigo, and Célia M. Gouveia	
<b>Preparation and Property of Microcapsules for Fire Prevention</b> .....	471
Kai Wang, Yunzhong He, Jun Deng, and Furu Kang	
<b>Experimental Study of Flame Height of Double Oil Tank Fires Under Different Lip Heights and Distances</b> .....	472
Ruowen Zong	
<b>Fire Safety Evaluation on Cultural Relics in Shaanxi, China</b> .....	473
Jiajia Song, Jingyu Zhao, Kai Wang, and Jun Deng	
<b>Fire Tests of CLT Specimen Protected by Intumescent Paint</b> .....	474
Lars Sørensen and Frank Markert	
<b>Fire Resistance of Wooden Panels with Retarded Clay Plaster</b> .....	475
Radovan Gracovský, L'udmila Tereňová, and Anna Danihelová	
<b>New Type Fire-Retardant for Various Wood Products</b> .....	476
Jussi Ruponen and Jari Kukkonen	
<b>Author Index</b> .....	477

# Author Index

## A

Acevedo, Pahola, 9  
Afanasenko, Kostiantyn, 432, 445  
Agafontsev, Mikhail, 203  
Alexis, Coppalle, 455  
Alonso, Catarina, 461  
Andrews, Gordon E., 50, 137  
Anielkis, Batista, 120  
Asadauskas, Svajus, 114  
Atroshenko, Yuliana K., 335  
Audebert, Maxime, 397  
Avellaneda, Alina, 103

## B

Badergruber, Thomas, 238  
Bai, Lei, 456  
Bala, Anu, 281  
Balog, Karol, 16, 159  
Barber, David, 213  
Bartłomiej, Mazela, 120  
Batilović, Mehmed, 347  
Bechle, Nathan J., 3  
Béreyziat, Antoine, 397  
Bhattacharyya, Debesh, 318  
Bihina, Gisèle, 420  
Bletzer, Claus, 457  
Borovykov, Volodymyr, 288  
Bouchaïr, Abdelhamid, 173, 397, 420  
Bourne, Keith J., 232  
Bradáčová, Isabela, 275  
Brazinskiene, Dalia, 114  
Brunkhorst, Sven, 185

Bujnak, Jan, 173  
Bulthuis, Roy J. H., 90  
Bursiková, Petra, 454

## C

Česelská, Tereza, 275  
Chanda, Avishek, 318  
Chen, Lingzhu, 244  
Chen, Xi, 244  
Chernov, Anatolii, 462  
Coppalle, Alexis, 9, 459  
Corine, Lacour, 455

## D

Danihelová, Anna, 475  
Dash, Ashish Kumar, 281  
Deeny, Susan, 213  
Deng, Jun, 456, 464, 471, 473  
Desroches, Gaël, 469  
Dhima, Dhionis, 397  
Dixon, Robert, 213  
Dotsenko, Olexander, 288  
Draganić, Suzana, 347  
Durif, Sébastien, 397, 420  
Dutta, Swagata, 318

## E

Elsagan, Nour, 166, 404  
Emmerich, Lukas, 97  
England, Paul, 219  
Eremina, Tatyana, 109, 129  
Erenberg, Marina, 457

**F**

Fedchenko, Svitlana, 326  
 Feldkamp, Martin, 457  
 Feshchuk, Yurii, 288  
 Flach, Michael, 238  
 Founti, Maria A., 251  
 Friedrichová, Romana, 454

**G**

Garskaite, Edita, 114  
 Gašpercová, Stanislava, 311  
 Gauthier, Florence, 469  
 Golubnichiy, Egor, 203  
 Gonchikzhapov, Munko, 462  
 Gouveia, Célia M., 461, 470  
 Gracovský, Radovan, 475  
 Gudnadottir, Iris, 226  
 Gupta, Supratic, 281

**H**

Hadjisophocleous, George, 303  
 Han, Chongqing, 244  
 Hansson, Lars, 114  
 Harbuz, Serhii, 125  
 Hasanov, Khalid, 432, 445  
 Hasburgh, Laura E., 22, 232  
 Haurie, Laia, 103  
 He, Yunzhong, 471  
 Holécý, Ján, 341  
 Horvathova, Michaela, 41  
 Hryhorenko, Oleksandr, 125  
 Hu, Xiaofeng, 244

**I**

Iringová, Agnes, 258  
 Iskra, Boris, 219  
 Izydorczyk, Daniel, 152, 463

**J**

Jancík, Juraj, 144  
 Jochim, Stanislav, 295  
 Jones, Dennis, 83  
 Just, Alar, 268

**K**

Kamenická, Zuzana, 159  
 Kamiya, Kyoko, 35, 66  
 Kang, Furu, 464, 471  
 Karl, Jan, 454  
 Karlsson, Bjorn, 226  
 Karlsson, Olov, 83  
 Kasymov, Denis, 203  
 Kinateder, Max, 404  
 Klouda, Karel, 410

Klyuchka, Yuriy, 432, 445  
 Knez, Friderik, 465, 467  
 Knez, Nataša, 465, 467  
 Ko, Yoon, 166, 404  
 Kolaitis, Dionysios I., 251  
 Kołakowski, Bartłomiej, 361  
 Konárik, Milan, 438  
 Kontis, Christos, 251  
 Korená Hillyayová, Michaela, 341  
 Korets, Mikhail A., 379  
 Korobeinichev, Oleg, 462  
 Korolchenko, Dmitry, 129  
 Kraler, Anton, 238  
 Kryshstal, Dmytro, 179  
 Kučera, Petr, 275  
 Kukkonen, Jari, 476  
 Kuracina, Richard, 16  
 Kuzmić, Tatjana, 347  
 Kuznetsov, Geniy V., 335  
 Kuznetsova, Irina, 109, 129  
 Kwiatkowski, Mirosław, 361

**L**

Laban, Mirjana, 347  
 Lacasta, Ana María, 460  
 Lacour, Corine, 9, 459  
 Le Levé, Clemens, 238  
 Li, Hu, 50  
 Lin, Chia-feng, 83  
 Lü, Huifei, 456  
 Lypovyí, Volodymyr, 125

**M**

Magdolenová, Paulína, 144  
 Mäger, Katrin Nele, 268  
 Makovicka Osvaldova, Linda, 41, 295  
 Maksimović, Jovana, 347  
 Mantanis, George I., 83  
 Markert, Frank, 144, 474  
 Marková, Iveta, 58  
 Marković, Marko, 347  
 Martinez, Angel, 9, 455, 459  
 Martinka, Jozef, 28, 159, 426  
 Martynov, Pavel, 203  
 Mat Kiah, Miss H., 50, 137  
 Matsagar, Vasant, 281  
 Matta, Kamil, 386  
 Mayer, Aaron Kilian, 97  
 Militz, Holger, 97  
 Miyamoto, Byrne, 3  
 Monton, Joaquin, 103  
 Moutarde, Marianne, 469  
 Musolff, André, 457  
 Mustafa, Bintu Grema, 50, 137

**N**

Nehrig, Marko, 457  
 Nejtková, Miroslava, 191  
 Nekora, Olha, 326  
 Nesterenko, Artem, 179  
 Nizhnyk, Vadym, 288  
 Nuianzin, Oleksandr, 179

**O**

Oostra, Mieke A. R., 90  
 Osvald, Anton, 72  
 Oulboukhitine, Salah, 420  
 Owusu, Aba, 303

**P**

Pahola, Acevedo, 455  
 Páscoa, Patrícia, 461  
 Pazlar, Tomaz, 465  
 Perminov, Vladislav, 203  
 Perminov, Valeriy, 354  
 Phylaktou, Herodotos N., 50, 137  
 Pilar Giraldo, María, 460  
 Plaza, Nayomi Z., 22  
 Pokorný, Jiří, 275  
 Pondelak, Andreja, 465, 467  
 Pozdieiev, Serhii, 288, 326

**R**

Rammer, Douglas, 3  
 Rantuch, Peter, 28, 159, 426  
 Rensink, Stephanie, 90  
 Repič, Rožle, 465, 467  
 Restas, Agoston, 367  
 Reyno, Vladimir, 203  
 Rodionova, Lyubov, 109  
 Roupцова, Petra, 410  
 Ruponen, Jussi, 476  
 Russo, Ana, 470  
 Růžička, Milan, 454

**S**

Sæle, Steffen Oliver, 197  
 Saienko, Nataliia, 125  
 Sailer, Michael F., 90  
 Salem, Osama (Sam), 303  
 Samchenko, Taras, 179  
 Sandanus, Jaroslav, 159

Sandberg, Dick, 83, 114  
 Sauerbier, Philipp, 97  
 Saulnier, Véronique, 420  
 Sędlak, Bartłomiej, 152, 453, 463  
 Segura, Andreu, 460  
 Ševčík, Libor, 454  
 Sever-Škapin, Andrijana, 465, 467  
 Shmakov, Andrey, 462  
 Si Larbi, Amir, 397  
 Sidnei, Stanislav, 326  
 Skripko, Martin, 468  
 Slivkova, Simona, 410  
 Sofronova, Tatiana M., 379  
 Song, Jiajia, 473  
 Sørensen, Lars, 474  
 Steenbakkens, Pascal, 213  
 Štefko, Tomáš, 426  
 Štefková, Jaroslava, 72  
 Stone, Donald S., 22  
 Strizhak, Pavel A., 335  
 Sugawa, Osami, 35, 66  
 Sulik, Paweł, 152, 453, 463  
 Šullová, Monika, 438  
 Szabová, Zuzana, 16  
 Szajewska, Anna, 374  
 Szczygieł, Ryszard, 361

**T**

Tatarenko, Valeriy, 462  
 Tereňová, L'udmila, 475  
 Tiso, Mattia, 268  
 Tomasson, Bodvar, 226  
 Trigo, Ricardo M., 470  
 Tschilas, Christoforos, 251

**V**

Vandlíčková, Miroslava, 58, 311  
 Verbrugge, Norma, 469  
 Vieira, Inês, 470  
 Voitkov, Ivan S., 335  
 Volkov, Roman S., 335  
 Volokitina, Aleksandra V., 379

**W**

Wachter, Igor, 28, 426  
 Wang, Kai, 471, 473  
 Wang, Weifeng, 456

Wang, Zhengchang, [244](#)  
Wille, Frank, [457](#)  
Wojciech, Grześkowiak, [120](#)

**X**

Xu, Qingfeng, [244](#)

**Y**

Yon, Jérôme, [459](#)

**Z**

Zachar, Martin, [295](#)  
Zahari, Rosmawati, [137](#)  
Zehfuß, Jochen, [185](#)  
Zelinka, Samuel L., [3](#), [22](#), [232](#)  
Zemlianskyi, Oleh, [179](#)  
Zeng, Yangfu, [137](#)  
Zhao, Jingyu, [456](#), [464](#), [473](#)  
Zong, Ruowen, [472](#)