

# Preface

Dear and distinguished readers of this publication:

In an era where we are all watching and taking part in development of the 4<sup>th</sup> Industrial Revolution, the once far away Horizon 2020 is already here, and where competition and globalization have been enhanced by the increased use of robots and artificial intelligence and came to know no limits and stopped long ago being friendly in the marketplace, the multi-perspective analysis and improvement of production technologies and associated materials science have become essential for most business levels in the manufacturing world. Usually, either if it is in mechanical and machine designs, the investigation and development of new materials, in more trendy areas like polymers, composites, bio-materials or in any other of the areas the Production Technologies and Materials Science fields are usually divided in, the main challenges and problems can be defined as planning, design, development and experimentation, validation, implementation, optimization and control ones. In dealing with these problems, improvement and innovation efforts are not only to encompass conventional approaches, but also modern ones that help altogether evolving the fields. Examples of such more modern approaches are: high precision technologies (optics and machining), high performance computing and methods of design, rapid prototyping, the use of composite materials for stronger lighter results, the increasing use of biomaterials, and the use of specialized simulation software for design and/or analysis of materials, parts and systems, to just cite a few.

Being aware of all these needs and challenges and consisting of a solid experience in the Materials Science and Production Technologies fields, the editors, who work for the **Institute of Production Technologies (IPT)**, belonging to the Faculty of Materials Science and Technology (MTF) of the Slovak University of Technology (STU), having already successfully organized the 2012 Central European Conference on Logistics (CECOL 2012) and published six other special volumes, i.e.: CECOL 2012, NTPDS 2013, NTPDS II, NTPDS III, NTPDS IV, NTPDS V, in this occasion proudly present the seventh volume and the sixth edition of the book **Novel Trends in Production Devices and Systems (NTPDS VI)**.

Like previous editions, the **NTPDS VI** special volume is aimed at publishing scientific achievements in the fields of Materials Science and associated Production Technologies and enhancing the worldwide cooperation among young and senior academicians and/or practitioners, and specially those from the European region. The volume has been enriched taking into account years of research and teaching activities in these fields, experiences resulting from the scientific collaboration among higher education centers, e.g.: CECOL, while at the same time by also counting on a prestigious editorial review board that made strong analyses of the submitted papers. Some of the main topics included in the book are those related but not limited to the trends in Materials Science and their application in industry, e.g.: composites and biomaterials, polymers, materials weldability, analysis of metals and alloys, numerical analysis and simulation of materials, etc. Most of these topics keep a direct relation to the production technologies and systems and thus, always keeping a special focus on the materials used, there are also topics in the book addressing the mechanical and machines designs, machining tools and processes, forming, automation, new materials in the context of Industry 4.0, rapid prototyping, additive manufacturing, and novel software and IT applications in Materials Science, Production Technologies and Systems, among others. Based on the diversity of such topics, and for the sake of better reading and comprehension, the book has been divided into four chapters containing similar topic-related contributions. This way, the book also becomes a valuable reference and study material for persons working and/or studying in the mentioned fields.

During the process of revision, analysis and edition of the contents of this publication, we have had the chance of acquiring a rich and better overview of the trends and research lines in Materials Science, Production Technologies and adjacent areas. We have also felt fulfilled while putting all of

our effort, modest knowledge and experience in the improvement and adequacy of the contents; at the same time, we have been enriched both as human beings and professionals throughout this process and thus, we strongly but modestly believe, this is a material from which you will certainly acquire some knowledge.

Finally, we would like to deeply thank the editors for their valuable support, the members of the editorial review board for their expertise, and last but not least, the TRANS TECH PUBLICATIONS INC team for their support and sustained professionalism in the publishing of the book throughout all these years. With our warmest and most sincere regards,

Daynier Rolando Delgado Sobrino and Karol Velíšek

# Committees

## Editor-in-Chief:

Delgado Sobrino, Daynier Rolando, SK  
Velíšek, Karol, SK

## Editor-in-Chief

Delgado Sobrino, D. R., SK  
Velíšek Karol, SK

## Editors

Mudriková Andrea, SK  
Delgado Sobrino, D. R., SK

## Editorial review board

Alic Carmen, RO  
Bađurová Jitka, CZ  
Bâlc Nicolae, RO  
Balič Jože, SI  
Belina Károly, HU  
Bere Paul, RO  
Bohács Gábor, HU  
Brajlih Tomaž, SI  
Brezinová Janette, SK  
Brindasu Paul Dan, RO  
Čaplovič Ľubomír, SK  
Čaus Alexander, SK  
Čep Robert, CZ  
Čička Roman, SK  
Coello Machado Norge I., CU  
Cofaru Nicolae-Florin, RO  
Dekýš Vladimír, SK  
Delgado Sobrino, D. R., SK  
Dománková Mária, SK  
Draganovská Dagmar, SK  
Durakbasa Numan, AT  
Ďuriška Libor, SK  
Gelu Ovidiu Tirian, RO  
Gołębski Rafał, PL  
Glistau Elke, DE  
Hajduk Mikuláš, SK  
Hajdu Štefan, SK  
Hausnerová Berenika, CZ  
Holešovský František, CZ  
Holubek Radovan, SK  
Jurči Peter, SK

Jerz Jaroslav, SK  
Jerz Vladimír, SK  
Kiss Imre, RO  
Kolíbal Zdeněk, CZ  
Košťál Peter, SK  
Kovács György, HU  
Kozak Dražan, HR  
Kukielka Leon, PL  
Kundrák János, HU  
Lancea Camil, RO  
Lazarević Mihailo, RS  
Legutko Stanislav, PL  
Lenfeld Petr, CZ  
Maňková Ildikó, SK  
Marônek Milan, SK  
Martinkovič Maroš, SK  
Mendřický Radomír, CZ  
Moravčík Roman, sk  
Morovič Ladislav, SK  
Mudriková Andrea, SK  
Nyers József, RS  
Oancea Gheorghe, RO  
Peterka Jozef, SK  
Rokosz Krzysztof, PL  
Ružarovský Roman, SK  
Sabin Popa Marcel, RO  
Sahul Martin, SK  
Sárosi József, HU  
Spišák Emil, SK  
Stančeková Dana, SK  
Šugár Peter, SK  
Šugárová Jana, SK  
Tolnay Marian, SK  
Ungureanu Nicolae, RO  
Václav Štefan, SK  
Varga Gyula, HU  
Velíšek Karol, SK  
Žmindák Milan, SK

# **Organized by**

**Institute of Production Technologies,**  
Faculty of Materials Science and Technology in Trnava,  
Slovak University of Technology in Bratislava.