

## Preface

Dear and distinguished readers of this publication:

In an era where we are all watching and taking part in the first steps of the 4<sup>th</sup> Industrial Revolution (Industry 4.0) and aiming at the Horizon 2020, also where competition and globalization have come to know no limits, and long ago stopped being friendly in the marketplace, the multi-perspective analysis and improvement of production technologies and associated materials science have become essential for almost each business level and dimension of 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 found can be defined as planning, design, development and experimentation, 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 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 four other previous editions of the present special volume, i.e.: CECOL 2012, NTPDS 2013, NTPDS II and NTPDS III, in this occasion proudly presents the fourth edition of the book titled: **Novel Trends in Production Devices and Systems IV (NTPDS IV)**.

Similar to previous editions, the **NTPDS IV** special volume is aimed at publishing scientific achievements in the fields of Materials Science and associated Production Technologies, as well as at 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 analyses and simulation of materials, etc. Most of these topics keeps 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, the 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 a better reading and comprehension, the book has been divided in 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 on 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, also the members of the editorial review board for their expertise and cooperation, 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

# Committee

**Editor-in-Chief**

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

**Editors**

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

**Editorial Review Board**

Alic Carmen, RO  
Bad'urová Jitka, CZ  
Bâlc Nicolae, RO  
Balič Jože, SI  
Belina Károly, HU  
Bere Paul, RO  
Bohács Gábor, HU  
Brindasu Paul Dan, RO  
Bruncko Jaroslav, SK  
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  
Drstvenšek Igor, SI  
Durakbasa Numan, AT  
Ďuriška Libor, SK  
Glistau Elke, DE  
Hajduk Mikuláš, SK  
Hausnerová Berenika, CZ  
Holešovský František, CZ  
Holubek Radovan, SK  
Illés Béla, HU

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  
Maňková Ildikó, SK  
Manlig František, CZ †  
Marônek Milan, SK  
Martinkovič Maroš, SK  
Moravčík Roman, sk  
Morovič Ladislav, SK  
Mudriková Andrea, SK  
Náplava Antonín, SK  
Nyers József, RS  
Oancea Gheorghe, RO  
Peterka Jozef, SK  
Rokoss Krzysztof, PL  
Ružarovský Roman, SK  
Sabin Popa Marcel, RO  
Sahul Martin, SK  
Sárosi József, HU  
Stančeková Dana, SK  
Šugár Peter, SK  
Šugárová Jana, SK  
Tolnay Marian, SK  
Ungureanu Nicolae, RO  
Václav Štefan, SK  
Varga Gyula, HU  
Velíšek Karol, SK

## Organized by

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