

# Preface

The International Symposium on Metallography “Metallography 2013” was held on 24 – 26 April 2013 in Stará Lesná in the beautiful surroundings of High Tatra Mountains, Slovak Republic. It was the grand 15<sup>th</sup> edition of the regular international symposium. The tradition of these conferences was established by Professor Ivan Hrivňák, the father of physical metallurgy in Slovakia back in 1969, and more recently they have been held at three-year intervals. They have featured as and still are important events for presentation of results achieved in materials science and engineering. The scope of the conference has long transcended the field of metal materials alone, and it is now a forum for presenting the latest research results as well as numerous modern materials and technologies.

At the turn of the 19<sup>th</sup>-20<sup>th</sup> century metallography was just beginning to show its usefulness. At that time there were no insights into the relation between microstructure (let alone substructure) and the properties of alloys, but the promoters of the new science such as J. B. Austen, E. C. Bain and J. R. Vilella could sense its huge potential. The development during the 20<sup>th</sup> century of further techniques beyond light microscopy for the investigation of metal materials and the introduction of new types of materials and technologies means that the capabilities of such microscopes have long been exceeded. Nevertheless, they still remain an indispensable research tool for today’s materials specialists, particularly since their use has been extended to cover the immensely wide spectrum of new materials, as we can see in the range of contributions proposed for this conference.

Metallography, as an original group of research methods, has expanded in recent years to such an extent that with its classical and special techniques it covers a wide range of material sciences, and even reaches beyond its original border-line. It is not surprising, and I am very glad, that our original “family of classic metallographers” is widening to include materials specialists from various branches (e.g. archaeology, care of historical monuments, medical sciences...) and therefore it is becoming a wide community which is gaining – due to its multidisciplinary character – even stronger potential for new approaches, new technologies and new findings in fundamental research as well as in practical production.

This Conference has always had participants from abroad, but since the expansion of the EU, interest in it has definitely grown. Also the conference programme last conference was, it would say, overcrowded. For this reason we have divided the program into three parallel sessions. These sections heard a combined total of eight invited lectures, and five can be found at the beginning of these Proceedings. At the conference, most of the authors chose to present their papers orally, and the others were in the form of posters. All in all 168 scientists from 12 countries participated in the scientific programme. We have received 144 abstracts, of which 139 have been presented at the conference, and 123 are presented as papers here in the Proceedings – Special Issue of Materials Science Forum and most of them are very interesting in content and bring new knowledge to the science of materials.

I am very grateful to all our sponsors and a big vote of thanks must go to our principal sponsor, U. S. Steel Košice, s.r.o. The Conference Committee also wishes to acknowledge the assistance and encouragement that we have received from our co-organizers, many other individuals and organizations in the preparation of this event.

My special thanks are due to the Chairmen of International Scientific Committee Petr Zuna from Czech Republic and Kenji Ikeuchi from of Japan for the assistance in the selection of the invited speakers and also all members of this committee for their help and advice in the preparation of the Conference. Thanks are also due to all the session chairmen, who directed the programme. We are also very grateful to the reviewers, whose very consistent reviewing of manuscripts was of great help in improving the quality of many papers. I also owe my gratitude to the publishers of this journal for their willingness to deal with the papers of these Proceedings.

I am also very grateful to Anton Čižmár, rector of the Technical University of Košice, Peter Horňák, Dean of the Faculty of Metallurgy from Technical University of Košice and Martin Fujda, Head of Department of Materials Science of Metallurgical Faculty of Technical University of Košice for their help during conference preparation.

I am particularly thankful to the members of the Organizing Committee: Mr. Marek Vojtko – Secretary, Mr. Peter Horňák - Dean of the Faculty of Metallurgy, Mr. Martin Fujda – Head of Dept. of Materials Science, Mr. Pavel Bekeč, Mr. Marián Buršák, Mr. Miroslav Glogovský, Mrs. Mária Fedorová, Mrs. Mária Hagarová, Mrs. Viera Horáková, Mrs. Petra Lacková, Mr. Svätoboj Longauer, Mr. Miloš Matviša, Mr. Ondrej Milkovič, Mr. Ladislav Pešek, Mr. Martin Šebek, Mr. Pavol Zubko, Mr. Ruslan Shvab, Mrs. Mária Huráková and Mrs. Lucia Hrabčáková.

My special thanks are due to Mr. Marek Vojtko, conference secretary and Mr. Pavol Zubko, coeditor for their help not only with Conference preparation, but also with preparation of the Abstract Booklet and enormous work with preparing of the Conference Proceedings. I am very grateful also to Mr. Ondrej Milkovič, who prepared conference web site.

The scientific success of this conference was first of all a result of the quality and the scientific motivation of its participants. Therefore, in the name of the Conference Organizing Committee METALLOGRAPHY 2013 I would like to thank all participants for their presence and for their contributing to a special friendly atmosphere during Conference, generated not only by the topics to be discussed but also by the marvels of nature surrounding us in the High Tatra Mountains.

Margita Longauerová  
Chair of the Symposium

**The Conference is organized by**

**DEPARTMENT OF MATERIALS SCIENCE, FACULTY OF METALLURGY  
TECHNICAL UNIVERSITY OF KOŠICE**

Park Komenského 11, 042 00 Košice, SLOVAKIA

Phone: +421 55 602 27 74, +421 55 602 27 80, Fax: +421 55 602 22 43

E-mail: Margita.Longauerova@tuke.sk, Marek.Vojtko@tuke.sk

Website: www.tuke.sk/metalo

**in cooperation with**

**INSTITUTE OF MATERIALS RESEARCH OF THE SLOVAK ACADEMY OF  
SCIENCES IN KOŠICE, SLOVAKIA**

**METAL SCIENCE SOCIETY AT THE SLOVAK ACADEMY OF SCIENCES  
SOCIETY OF PROFESSIONAL METALLURGISTS, SLOVAKIA  
INSTITUTE OF EXPERIMENTAL PHYSICS OF THE SLOVAK ACADEMY OF  
SCIENCES IN KOŠICE, SLOVAKIA  
U. S. STEEL KOŠICE, s. r. o.**

**CHAIR OF THE SYMPOSIUM**

**Margita Longauerová** Technical University of Košice, Slovakia

**ORGANIZING COMMITTEE**

**Margita Longauerová** - Chair

Marek Vojtko – Secretary

Peter Horňák - Dean of the Faculty of Metallurgy

Martin Fujda – Head of Dept. of Materials Science

Pavel Bekeč

Marián Buršák

Miroslav Glogovský

Mária Fedorová

Mária Hagarová

Viera Horáková

Petra Lacková

Svätoboj Longauer

Miloš Matvija

Ondrej Milkovič

Ladislav Pešek

Martin Šebek

Pavol Zubko

Ruslan Shvab, Institute of Materials Research of SAS, Košice, Slovakia

Mária Huráková, Institute of Experimental Physics of the SAS, Košice, Slovakia

Lucia Hrabčáková, USSE Research & Development Center, U. S. Steel Košice, Slovakia

## INTERNATIONAL SCIENTIFIC COMMITTEE

### Joint Chairmen

<i>Petr Zuna</i>	Czech Technical University, Prague, Czech Republic
<i>Kenji Ikeuchi</i>	Osaka University, Osaka, Japan
Peter Bernasovský	Welding Research Institute, Bratislava, Slovakia
Jozef Billy	U. S. Steel Košice, s. r. o., Slovakia
Kornel Csach	Institute of Experimental Physics of SAS, Košice, Slovakia
Pavel Diko	Institute of Experimental Physics of SAS, Košice, Slovakia
Ján Dusza	Institute of Materials Research of SAS, Košice, Slovakia
Jana Dobrovská	VŠB - Technical University, Ostrava, Czech Republic
Alistair Doig	Defence Academy of the UK, Shrivenham, Oxford, UK
Roland Haubner	University of Technology Vienna, Institute of Chemical Technologies and Analytics, Vienna, Austria
Christian Chimani	LKR Leichtmetallkompetenzzentrum Ranshofen GmbH, Austrian Institute of Technology, Austria
Zdeněk Jonšta	VŠB - Technical University, Ostrava, Czech Republic
Radomila Konečná	University of Žilina, Žilina, Slovakia
Tibor Kvačkaj	Technical University of Košice, Slovakia
Ludvík Kunz	Institute of Physics of Materials AS CR, Brno, Czech Republic
Pavel Lejček	Institute of Physics, AS CR, Prague, Czech Republic
Svätoboj Longauer	Technical University of Košice, Slovakia
Margita Longauerová	Technical University of Košice, Slovakia
Eva Mazancová	VŠB - Technical University, Ostrava, Czech Republic
Wojciech Maziarz	Polish Academy of Sciences, Krakow, Poland
Akio Nishimoto	Kansai University, Osaka, Japan
Jacques G. Noudem	Université de Caen Basse-Normandie, Cherbourg, France
Ľudovít Parilák	ŽP Research & Development Center s.r.o., Podbrezová, Slovakia
František Simančík	Institute of Materials & Machine Mechanics of SAS, Bratislava, Slovakia
Kenji Shinozaki	Hiroshima University, Higashi-Hiroshima, Japan
Peter Ševc	Institute of Materials Research of SAS, Košice, Slovakia
Jiří Švejar	University of Technology, Brno, Czech Republic
Eva Tillová	University of Žilina, Žilina, Slovakia
Miroslav Tvrďý	VŠB - Technical University, Ostrava, Czech Republic
George Vander Voort	USA
Vlastimil Vodárek	VŠB - Technical University, Ostrava, Czech Republic
Dalibor Vojtěch	Institute of Chemical Technology, Prague, Czech Republic
Bogdan Wendler	Technical University of Lodz, Poland
Jozef Zrník	COMTES FHT Ltd., Dobřany, Czech Republic

### HONORARY COMMITTEE

Margita Longauerová	Chair of the Symposium and President of the Slovak Metal Science Society
Ivan Hrivňák	Founder of the Symposium
Anton Čižmár	Rector of the Technical University of Košice, Slovakia
Ľudovít Dobrovský	Dean of the Faculty of Metallurgy and Materials Engineering VŠB - Technical University, Ostrava, Czech Republic
Martin Fujda	Head of the Department of Materials Science, Technical University of Košice, Slovakia
Peter Horňák	Dean of the Faculty of Metallurgy, Technical University of Košice, Slovakia
Karol Iždinský	Director of the Institute of Materials & Machine Mechanics of SAS, Bratislava, Slovakia
Peter Korytko	General Manager, Research USSE, Entry Areal U.S. Steel, Košice, Slovakia U. S. Steel Košice, s. r. o., Slovakia
Ludvík Kunz	Director of the Institute of Physics of Materials, AS CR, Brno, Czech Republic
Ľudovít Parilák	ŽP Research & Development Center s.r.o., Podbrezová, Slovakia
David J. Rintoul	President of U. S. Steel Košice, s.r.o., Slovakia

Aleš Kučera	Director, Astronomical Institute of the Slovak Academy of Sciences, Tatranská Lomnica, Slovakia
Vladimír Soták	President, Železiarne Podbrezová a. s., Slovakia
Peter Ševc	Director of the Institute of Materials Research of SAS, Košice, Slovakia
George Vander Voort	USA
Vlastimil Vodárek	Head of the Department of Materials Engineering, VŠB - Technical University, Ostrava, Czech Republic
Vladimír Zvarík	Production Director, Železiarne Podbrezová a. s., Slovakia
Petr Zuna	Vice-dean of the Faculty of Mechanical Engineering, Czech Technical University, Prague, Czech Republic

## Acknowledgement

A big vote of thanks must go to our principal sponsor, U. S. Steel Košice, s.r.o. and also SMZ - Slovak Magnesite Works, Jelšava. The list of companies taking part in the exhibition, and which also sponsor this symposium, is as follows: TSI System s.r.o., STRUERS GmbH - Organization Division, MITAR s.r.o., Carl ZEISS SLOVAKIA s.r.o., NIKON spol. s.r.o., ZENA – R Slovakia s.r.o., JEOL (Europe) SAS – Organization Division, Edlin s.r.o., METROTEST s.r.o. The Conference Committee also wishes to acknowledge the assistance and encouragement that we have received from many other individuals and organizations in the preparation of this event.

