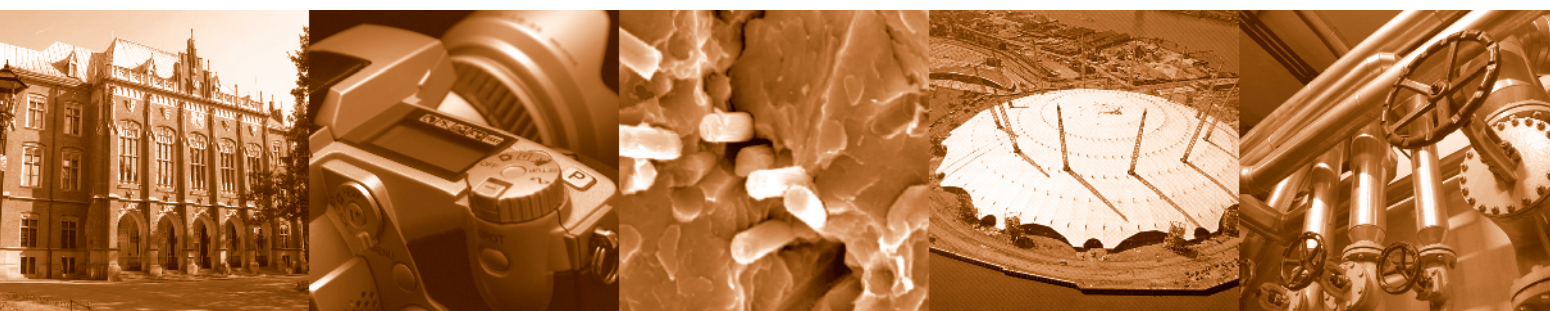




Volume 41
Issue 1
January 2010
Pages 1-64

Published since 1978
formerly as Archives of Materials Science
or Archiwum Nauki o Materiałach (in Polish)

Archives of Materials Science and Engineering



Editor-in-Chief Prof. Leszek A. Dobrzański

International Scientific Journal published monthly
by the World Academy of Materials
and Manufacturing Engineering

<http://www.archivesmse.org>



Editor-in-Chief

Prof. Leszek A. Dobrzański – Gliwice, POLAND

Deputies Editor-in-Chief

Prof. Gilmar Batalha – Sao Paulo, BRASIL
Prof. Nikolaos Gouskos – Athens, GREECE
Prof. Toshio Haga – Osaka, JAPAN
Prof. Abdel Magid Hamouda – Doha, QATAR
Prof. Mark J. Jackson – West Lafayette, USA
Prof. Thomas Neitzert – Auckland, NEW ZELAND
Prof. Jerzy Nowacki – Szczecin, POLAND
Prof. Ming-Jen Tan – Singapore, SINGAPORE

Associate Editors

Dr Mirosław Bonek – Gliwice, POLAND
Dr Małgorzata Drak – Gliwice, POLAND
Dr Klaudiusz Gołombek – Gliwice, POLAND
Dr Daniel Pakuła – Gliwice, POLAND

Production Editor

Ms Marzena Kraszewska, MA – Gliwice, POLAND

Reading Direct Editors

Mr Adam Jagiełło, MSc – Gliwice, POLAND
Mr Piotr Zarychta, MSc – Gliwice, POLAND

Submission Officer

Dr Magdalena Polok-Rubinić – Gliwice, POLAND

Computer typesetters

Ms Anna Achtełik, MSc – Gliwice, POLAND
Ms Justyna Hajduczek, MSc – Gliwice, POLAND
Dr Anna Włodarczyk-Fligier – Gliwice, POLAND
Dr Bogusław Ziębowicz – Gliwice, POLAND

International Editorial Board Members

Prof. Dorel Banabic – Cluj Napoca, ROMANIA
Prof. Tadeusz Bołd – Gliwice, POLAND
Prof. Tara Chandra – Wollongong, AUSTRALIA
Prof. Antonio Cunha – Guimaraes, PORTUGAL
Prof. Jan Cwajna – Katowice, POLAND
Prof. Edward D. Doyle – Swinburne, AUSTRALIA
Prof. Georgy Drapak – Khmelnytsky, UKRAINE

Prof. Jan Dutkiewicz – Cracow, POLAND
Prof. Hong Hocheng – Hsinchu, TAIWAN
Prof. Stuart Hampshire – Limerick, IRELAND
Prof. Adam Hernas – Katowice, POLAND
Prof. Marek Hetmańczyk – Katowice, POLAND
Prof. Werner Hufenbach – Dresden, GERMANY
Prof. David Hui – New Orleans, USA
Prof. Yong-Taek Im – Daejeon, KOREA
Prof. Leopold Jeziorski Dr hc – Częstochowa, POLAND
Prof. Jan Kazior – Cracow, POLAND
Prof. Albert Kneissel – Leoben, AUSTRIA
Prof. Ivars Knets – Riga, LATVIA
Prof. Janez Kopac Dr hc – Ljubljana, SLOVENIA
Prof. Piotr Kula – Łódź, POLAND
Prof. Krzysztof J. Kurzydłowski – Warsaw, POLAND
Prof. Karl Kuzman – Ljubljana, SLOVENIA
Prof. Petr Louda – Liberec, CZECH REPUBLIC
Prof. Eugeniusz Łągiewka – Katowice, POLAND
Prof. Adolf Maciejny Dr hc – Katowice, POLAND
Prof. Bogusław Major – Cracow, POLAND
Prof. Stanisław Mitura Dr hc – Łódź, POLAND
Prof. Ryszard Nowosielski – Gliwice, POLAND
Prof. Abraham Atta Ogwu – Paisley, UK
Prof. Jerzy Pacyna – Cracow, POLAND
Prof. Fusheng Pan – Chongqing, CHINA
Prof. Lucjan Pająk – Katowice, POLAND
Prof. Jan Pilarczyk – Gliwice, POLAND
Prof. Wojciech Przetakiewicz – Warsaw, POLAND
Prof. Maria H. Robert – Campinas, BRAZIL
Prof. Mario Rosso – Turin, ITALY
Prof. Jan Sieniawski – Rzeszów, POLAND
Prof. Paul Siffert – Strassburg, FRANCE
Prof. Jorge A. Sikora – Mar del Plata, ARGENTINA
Prof. Bozo Smoljan – Rijeka, CROATIA
Prof. Jerry Sokolowski – Windsor, CANADA
Prof. Mirko Sokovic – Ljubljana, SLOVENIA
Prof. Antonio Sousa – Fredericton, CANADA
Prof. Vasco Teixeira – Braga, PORTUGAL
Prof. Miklos Tisza – Miskolc, HUNGARY
Prof. Laszlo Toth – Miskolc, HUNGARY
Prof. Boris Tomov Dr hc – Rousse, BULGARIA
Prof. Jose M. Torralba Dr hc – Madrid, SPAIN
Prof. Algirdas V. Valiulis – Vilnius, LITHUANIA
Prof. Tadeusz Wierzchoń – Warsaw, POLAND
Prof. Abdalla Wifi – Cairo, EGYPT
Prof. Władysław K. Włosiński Dr hc – Warsaw, POLAND
Prof. Stefan Wojciechowski Dr hc – Warsaw, POLAND
Prof. Gwomei Wu – Taoyuan, TAIWAN
Prof. Senay Yalcin – Istanbul, TURKEY
Prof. Bekir Sam Yilbas – Dhahran, SAUDI ARABIA
Prof. Andrzej Zieliński – Gdańsk, POLAND
Prof. Paweł Zięba – Cracow, POLAND
Prof. Jozef Zrnik – Plzen, CZECH REPUBLIC
Prof. Marcel Zitnansky – Bratislava, SLOVAK REPUBLIC

Patronage



World Academy
of Materials
and Manufacturing
Engineering



Association of
Computational Materials
Science and Surface
Engineering



Polish Academy of
Sciences, Committee
of Materials Science,
Section of Metallic
Materials



Institute of Engineering
Materials and
Biomaterials of Silesian
University of Technology,
Gliwice, Poland

Financial support

The efforts to achieve the financial support of the Journal in 2010 from the Ministry of Science and Higher Education in Poland have begun.

Abstracting services

This Journal is sent to individual receivers from ca. 50 countries of the world and is delivered to the National Libraries and Universities and also to other scientific institutions in ca. 50 countries of the world. The electronic system of Reading Direct allows to access to the electronic version of that journal on-line, in the promotional period free of charge. This Journal is included in the reference list of the Polish Ministry of Science and Higher Education (6 points). The Journal is cited by Abstracting Services such as:



DIRECTORY OF
OPEN ACCESS
JOURNALS



SCIRUS
for scientific information only



SCOPUS™

The procedure of its registration in the databases of Compendex, CiteSeer, GetCited and Web of science has begun.

Journal Registration

The Journal is registered by the 1st Civil Department of the District Court in Gliwice, Poland at number 278.

Publisher



INTERNATIONAL
OCSCO
WORLD PRESS

International OCSCO World Press
ul. S. Konarskiego 18a/366,
44-100 Gliwice, Poland

e-mail: info@archivesmse.org

Bank account: Stowarzyszenie Komputerowej Nauki

o Materiałach i Inżynierii Powierzchni

Bank name: ING Bank Śląski

Bank address: ul. Zwycięstwa 28, 44-100 Gliwice, Poland

Account number/IBAN CODE:

PL76105012981000002300809767

Swift code: INGBPLPW

Gliwice – Sao Paulo – Athens – Osaka – Doha – West

Lafayette – Auckland – Szczecin – Singapore

© 2010 International OCSCO World Press.

All rights reserved.

Reading Direct

This journal is a part of Reading Direct, the free of charge alerting service which sends tables of contents by e-mail for this journal and in the promotion period also the full texts of papers. You can register to Reading Direct at

<http://www.archivesmse.org>

© The paper used for this journal meets the requirements of acid-free paper.

Printed in Poland.

It was said...



**JOSÉ LUIS RODRÍGUEZ
ZAPATERO**

The Prime Minister of Spain

(...) Europe will only be strong when all its citizens are strong and when European citizens are seen to be strong, which requires new steps to develop and to make the rights of European citizens a reality. So, these are the four main priorities of our Presidency:

The first and essential priority for the development of the others is the full and effective application of the Lisbon Treaty. The second is to guarantee the economic recovery of Europe through greater co-ordination of every member state and the approval of the European strategy for sustainable growth for 2020. The third is to reinforce the presence and influence of the European Union in the new world order. Finally, the fourth is to place European citizens at the centre of EU policy, with initiatives designed to develop their rights and freedoms. (...) We are also convinced of the need to continue the reforms that will enable us to successfully face the pending challenges still to come, in order to accelerate recovery and achieve vigorous growth which generates employment.

The first challenge is globalisation itself. The advanced economies, and particularly the European economy, are facing intense competition from the emerging economies, in the area of costs. Europe's response to this should be to improve its capacity to innovate. Therefore, Spain's Presidency will promote the adoption of an ambitious European Innovation Plan that will cover the different aspects of innovation - regulatory, financial, educational and, of course, the reinforcement of specific policies to support R&D. The second challenge is climate change: a phenomenon that we can not ignore. Europe is taking the lead in the international arena and has already assumed commitments for emission reductions and the use of renewable energies. We need to take advantage of this transition to a low carbon economy to generate new jobs and additional sources of economic growth. (...) We will encourage different industrial and technological initiatives to consolidate Europe's leadership as a 'green economy'. The third challenge is to reinforce our social model in the areas of population ageing and the impact of the crisis, which has been especially noticeable in the labour market (...). The Spanish Presidency will promote initiatives to adapt workers skills to the demands of the labour market and improve educational quality, university excellence and continuous training. The response to these three challenges - economic, environmental and social - will be drawn up within the framework of a common strategy for the transformation of the European Union by 2020. The New Growth and Employment Strategy, to be approved during the Spanish Presidency, will deal with a limited number of quantitative goals and will establish a shared vision of the European Union's situation from a perspective of productive, environmental and social sustainability. Finally, the New Strategy should establish a dynamic and operational governance with the participation of all social representatives. All the European institutions need to feel they are active partners in the new strategy and we need to be able to implement a system to survey the results obtained by the governments of the different Member States and the Commission. (...)

From the Appearance of the Spanish Prime Minister before the Plenary Session of the Congress of Deputies to explain the conclusions of the European Council and to outline the priorities of the Spanish Presidency of the Council of the European Union in the first six months of 2010; Congress of Deputies, 16th December 2009, Madrid, Spain

Editorial

In few weeks time we will enter the New Year 2010. It will be the 6th year of activity of the World Academy of Materials and Manufacturing Engineering and at the same time the 6th year of issuing the Journal of Achievements in Materials and Manufacturing Engineering, also the 5th year of issuing the Archives of Materials Science and Engineering. As every new year, this one also brings new hopes and chances. And because of that we are sending our best wishes to individuals as well as to various institutions. We are also receiving more and more seasonal wishes including new year wishes, for which I hereby give my most sincere thanks. I wish the eminent Fellows of WAMME Academy, members of International Editorial Board and Deputies Editor-in-Chief, co-workers and sympathizers of the Journal, but most of all the PT Authors and the Readers all the best, success and good wealth in upcoming New Year of 2010.

For many people all over the world the year 2010 will be a special one, because already on 12th February 2010 the 21st Olympic Winter Games, which official host city will be Vancouver, BC in Canada, will begin. That is why on the cover of the given Issue of the Journal we demonstrate a few pictures, but from sunny, summer, not winter Vancouver, made relatively not long ago during one of many scientific conferences which took place every year in that beautiful city. The 2010 Winter Olympics for 16 days will attract attention of people all over the World. Those Olympics will be the third ones hosted by Canada. The Canadian Olympic Association chose Vancouver as the Canadian candidate city over Calgary and Quebec City. On the first round of voting on 21st November 1998, Vancouver-Whistler had 26 votes and on 3rd December 1998, in the second and final round of voting Vancouver win with 40 votes. Vancouver won the bidding process to host the Olympics by a vote of the International Olympic Committee on 2nd July 2003 in Prague, Czech Republic. Vancouver faced two other finalists: Pyeongchang, South Korea, and Salzburg, Austria.

The 2010 Olympic Winter Games will be one of the biggest ones in the history of international multi-sport event which will be hosted in Vancouver, with some events which will take place in the suburbs of Richmond, West Vancouver and the University Endowment Lands, and in the resort town of Whistler. Some venues, including the Richmond Olympic Oval, will be at sea level, a rarity for the Winter Games. The 2010 Games will be also the first – Winter or Summer – which will have an Opening Ceremony held indoors. The opening and closing ceremonies will be held at BC Place Stadium. Competition venues in Greater Vancouver included the Pacific Coliseum, the Vancouver Olympic/Paralympic Centre, the UBC Winter Sports Centre, the Richmond Olympic Oval and Cypress Mountain. GM Place, home of the NHL's Vancouver Canucks, renamed Canada Hockey Place for the duration of the Games, played host to ice hockey events. Competition venues in Whistler included the Whistler Blackcomb ski resort, the Whistler Olympic Park and the Whistler Sliding Centre.

The 2010 Winter Olympics logo will be a statue of Ilanaaq the Inunnguaq. Ilanaaq is the Inuktitut word for friend. The logo was based on the Inukshuk (stone landmark or cairn) built for the Northwest Territories Pavilion at Expo 86 and donated to the City of Vancouver after the event. It is now used as a landmark on English Bay Beach. The mascots for the 2010 Winter Olympic Games were introduced on 27th November 2007. Inspired by traditional First Nations creatures, the mascots include Miga – a mythical sea bear, part orca and part kermode bear and Quatchi – a sasquatch, who wears boots and earmuffs. The Royal Canadian Mint planned the production of a series of commemorative coins celebrating the 2010 Games.



It is foreseen that over 80 nations and ca. 2600 athletes will participate in this Olympic Winter Games. The number of events will exceed surely 85 in fifteen winter sports events. The eight sports categorised as ice sports were: bobsled, luge, skeleton, ice hockey, figure skating, speed skating, short track speed skating and curling. The three sports categorised as alpine skiing and snowboarding events were: alpine, freestyle and snowboarding. The four sports categorised as Nordic events were: biathlon, cross-country skiing, ski jumping and Nordic combined. The opening and closing ceremonies and the events categorised as ice sports (excluding bobsleigh, luge and skeleton) will be held in Vancouver and Richmond. The sports categorised as "Nordic events" will be held in the Callaghan Valley located just to the west of Whistler. All alpine skiing events will be held on Whistler Mountain (Creekside) and sliding events (bobsleigh, luge and skeleton) will be held on Blackcomb Mountain. Cypress Mountain (located in Cypress Provincial Park in West Vancouver) will be hosted the freestyle skiing (aerials, moguls and ski cross), and all snowboard events (half-pipe, parallel giant slalom, snowboard cross).

Of course to the material and manufacturing engineer's mind's eye sees that the competitions of athletes, who will compete for honourable Olympic medals in a noble fight, are accompanied by many-year efforts of many designers and manufacturers in order to provide athletes with as good equipment and devices as possible, assuring the best sports effect. This is great worldwide business, which innovational level keeping pace with space industry and others most avant-garde fields of technology. It is no wonder then that scientific and technological world follows sports competitions, not only because of sports excitement of followers, but also because of vivid professional and scientific interests. Our Journal always with the greatest interest publishes scientific papers concerning materials and technologies designed for equipment and devices used in sports, aware that in time those materials as well as technologies will get to recreation and soon after that to everyday use. Thus we encourage PT Authors to widen interest in this subject.

A stylized, handwritten signature in dark ink, appearing to read 'L. Dobrzanski'.

Prof. Leszek A. Dobrzanski M Dr hc
Editor-in-Chief of the AMSE
President of the WAMME
President of the ACSMSE