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Employment and positions

Institute of Metallurgy and Materials Science, Polish Academy of Sciences:

assistant (1970-1984), assistant professor (1985-1994), associate professor (1995-2001). From 2002 Professor with tenure.

From 2003 Secretary of the Scientific Council at the same Institute.

Scientific Career

M.Sc.: University of Mining and Metallurgy, 1970

Ph.D.: Institute of Metallurgy and Materials Science, Polish Academy of Sciences, 1984

D.Sc.: Institute of Metallurgy and Materials Science, Polish Academy of Sciences, 1994

Professor: President of the Republic of Poland, Scientific title, 2002

Full Professor: 2010

Scientific achievements

156 papers, among them: **140** papers in refereed journals and periodicals
(**44** of them (abstracted) cited by the Institute for Scientific
Information in Philadelphia), **134** presentations during
conferences, **3** books
and **6**
chapters in the books

The most relevant publications during last 5 years

1.

W. Wolczyński, *Concentration Micro-Field for Lamellar Eutectic Growth*, Defect and Diffusion Forum, 272, (2007), p. 123-138.

2.

C. Senderowski, Z. Bojar, **W. Wolczyński**, A. Pawłowski, *Microstructure Characterization of D-gun Sprayed Fe-Al Intermetallic Coatings*, Intermetallics, 18, (2010), p. 1405-1409.

3.

W. Wolczyński, *Lamella / Rod Transformation as Described by the Criterion of Minimum Entropy Production*, International Journal of Thermodynamics, 13, (2010), p. 35-42.

4.

W. Wolczyński, *Pattern Selection in Crystal Growth, Chapter 9 in the book: Modern Aspects of Bulk Crystal and Thin Film Preparation*, Rijeka - Croatia, 2012, p. 187-212, ed. In Tech, eds N. Kolesnikov & E. Borisenko.

5.

W. Wolczyński, W. Wajda, E. Guzik, *Thermal Gradients Behavior during the C-E Transition within Solidifying Massive Roll*, Solid State Phenomena, 197, (2013), p. 174-179.

6.

W. Wolczyński, C. Senderowski, J. Morgiel, G. Garzeł *D-gun Sprayed Fe-Al Single Particle Solidification Archives of Metallurgy and Materials*, 59, (2014), 211-220.

7.

W. Wolczyński, S. Kjelstrup, D. Bedeaux, J. Szajnar, B. Billia *Eutectic Structures Competition in the Stripes Strengthening the (Zn) - Single Crystal*, Archives of Foundry Engineering, 14, (2014), 95-102.

8.

W. Wolczyński, Z. Pogoda, G. Garzeł, B. Kucharska, A. Sypień, T. Okane, Part I. *Thermodynamic and Kinetic Aspects of the Hot Dip (Zn) - Coating Formation*, Archives of Metallurgy and Materials, 59, (2014), 1223-1233.

9.

W. Wolczyński, Z. Pogoda, G. Garzeł, B. Kucharska, A. Sypień, T. Okane, Part II. *Model for the Protective Coating Formation during Hot Dip Galvanizing*, Archives of Metallurgy and Materials, 59, (2014), 1393 - 1404.

10.

A. W. Bydałek, A. Bydałek, **W. Wolczyński**, S. Biernat, The
Concept of Slag Decopperisation in the Flash Furnace Process by Use of Complex Reagents,
Archives of Metallurgy and Materials, 60, 319-322 (2015).

11.

W. Wolczyński,
Mathematical Modeling of the Microstructure of Large Steel Ingots, Entry 196 in: The
Encyclopedia of Iron, Steel, and Their Alloys, Eds. Taylor & Francis Group, New York-USA,
2015.

12.

W. Wolczyński, B. Kucharska, G. Garzeł, A. Sypień, Z. Pogoda, T. Okane, Part III. Kinetics of
the (Zn) - Coating Deposition during Stable and Meta-Stable Solidifications, Archives of
Metallurgy and Materials, 60, 199-207 (2015).

13.

W. Wolczyński, A.W. Bydałek, Sedimentation of Copper Droplets after their Coagulation and
Growth. Laboratory Scale, Archives of Foundry Engineering, 16, 95-99 (2016).

Research Projects

Projects from Ministry of Science and Higher Education

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Formation of peritectic layers on the surface of materials subjected to the diffusion soldering -
Control of the technologies, (Individual Project No. 003 27/T08C/3), IMMS PAS, supervisor,

2004-2007.

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Control of the segregation in the middle-massive and massive ingots from alloys with high concentration of carbon, (Development Project No. 0060 04/R15/N), IMMS PAS, supervisor, 2008-2011.

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Optimization of the formation of single crystal strengthened by the intermetallic compound localized within the stripes generated cyclically, (Individual Project No. 480 038/N508/N) IMMS PAS, supervisor, 2010-2012.

European Union Projects

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COST, Action 531 - Lead-free solder materials, Task: Thermodynamic model for diffusion soldering IMMS PAS, supervisor, 2002-2006

International Projects

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Study of the kinetics for the multi-layer coatings formation, Project established in the cooperation between IMMS PAS and AIST (National Institute of Advanced Industrial Science and Technology), Tsukuba (Japan) in the framework PAS / JSPS, supervisor, 2005-2007.

Experience gained abroad

Institut de Recherches de la Siderurgie Francaise de Maizieres-les-Metz: Metz 1987-88 (7 months)
Universite d'Aix-Marseille:
Marseille 1992 (2 weeks), 1994 (1 week), 1996 (2 weeks), 1998 (2 weeks)
University of Tokyo
: Tokyo 1997 (2 weeks), 2000 (5 weeks)
Laboratory of Surface and Joining Technology - Duebendorf
: Zurich 2003 (1 week)

Prizes and awards

1976 Bronze Medal for the Merits for the Country's Defences

1984 Ph.D. with Honour and Prize of General Secretary of the Polish Academy of Sciences

2000 Distinction for the Supervisor of the best Ph.D. thesis in Poland in the Area of the Materials Engineering awarded by the Polish Association for Materials Science

2001 The Second Joint Prize in the Competition: "Polish Product of the Future" awarded by the Ministry of Education

2003 Special Mentioning in Polish Chronicle: "Gold Chronicle of the Technical Science"

2004 Knight's Cross Polonia Restituta

2006 Special Mentioning in Polish Chronicle: "Gold Chronicle of Polish Science – Scientists of the United Europe"

2006 Special Mentioning in Polish Chronicle: "Contemporary Polish Scientists"

2007 Special Mentioning in the USA Chronicle: "Who's Who in Science and Engineering" by the Marquis Who's Who

Education of scientific staff

Supervisor of 2 PhD thesis: Krystyna Rabczak (1999), Roman Cupryś (2000)

External reviewer 4 PhD, 2 DSc, 2 application for professor title

Reviewer: Archives of Metallurgy and Materials, Archives of Foundry Engineering, Ministry of Science and Higher Education.

Lectures:

PhD Study IMMS PAS - Jagiellonian University;

PhD Study IMMS PAS with the English language lectures

Power Point lectures on the CD disk with texts connected to three chapters of book for industry engineers. Action KETO supervised by the IFPT PAS Warszawa; Lectures via Internet for students from European Union organized by the University of Technology Milano with narration and questions for the program Metallurgical TRaining Online - METRO, in frame of the Action - Leonardo da Vinci;

Membership in professional societies

Polish Association for Materials Science,
Physics Section of the Metallurgy Committee of PAS,
Metallurgical - Foundry Section of the Metallurgy Committee of PAS,
Scientific Council of the Institute of Metallurgy and Materials Science.

Main scientific interest:

Solidification accompanied by the microsegregation. Mass transport during formation multi-layers coating or diffusion interconnections. Structural parameters selection with application of the thermodynamics of irreversible processes. Mass transport in the liquid during formation in situ composite. Heat transfer during formation massive ingots.

Fundamental activity at the Institute of Metallurgy and Materials Science
(structure formation modelling for multi-layers materials)

Some thermodynamic models are working out for structure formation:

a/ in the diffusion interconnection formed during isothermal soldering,
A competition between formation the stable intermetallic phases and meta-stable intermetallic phases is justified thermodynamically in the model. The phenomena of dissolution, solidification and the first solid / solid reaction are taken into account in the model. An occurrence of the undercooled peritectic reactions is justified. Some equations for the solute redistribution are proposed for each formed joint sub-layer.

b/ in the coating deposited by the D-gun method with partial melting of sprayed particles,
A competition between equilibrium and non-equilibrium phases formation is justified thermodynamically in the model delivered for the micro scale. It is also shown that the single particle deposited by D-gun spraying onto the steel substrate is subjected to partial melting. Some intermetallic phases solidification within the formed sub-layers is described. It is confirmed that the single particle behaviour corresponds well to behaviour of the diffusion interconnection during its solidification. An analysis of thermal gradients and growth rates allows for justifying the structural asymmetry of this kind of interconnection. The boron influence on the interconnection adhesion improvement is also described.

c/ in the protective coating which are obtained by the hot dip galvanizing,
Some thermodynamic conditions required by the protective coating formation are delivered. The appearing phases are treated as the result of peritectic reactions. An amount of growing phase is described mathematically. The role of the flux is taken into account as the third element for the Fe-Zn system. The behaviour of the flux which is transformed into a gas and evaporates in the course of nature is also described.

d/ in the single crystals strengthened by some layers of the intermetallic compound,
The structure of layers strengthening the single crystal is defined. A new, unknown up to date, criterion for structure selection within the layers is formulated based on the thermodynamics of irreversible processes. It takes into account the condition of minimum entropy production. A state of marginal stability is applied to the description of structural transformation of the irregular structure into the regular structure inside the strengthening layer.

