

Phone.: +48 12 295, room 009, Fax: +48 12 295 28 04

e-mail: [e.beltowska@imim.pl](mailto:e.beltowska@imim.pl) , beltowska@gmail.com \_

## Employment and positions

Institute of Metallurgy and Materials Science, Polish Academy of Sciences: assistant (1972-1978), assistant professor (1979-2006), associate professor (2007-2010), professor of the Polish Academy of Sciences (2010-2014), professor with tenure since 2015.  
Head of the Department of Surface Engineering and Biomaterials of the Institute of Metallurgy and Materials Science of the Polish Academy of Sciences since 2016.

## Scientific Career

**M.Sc.:** Jagiellonian University, 1971

**Ph.D.:** Jagiellonian University, 1979

**D.Sc.:** Institute of Metallurgy and Materials Science, Polish Academy of Sciences, 2007

**Professor:** President of the Republic of Poland, scientific title, 2015

## Scientific achievements

**96** papers in refereed journals and periodicals (**52** of them included in the Journal Citation Report database), **87** presentations during conferences, **3** books, **3** chapters in books.

Sum of the Times Cited: **440**, Hirsch index: **14**

### The most relevant publications

1.

**E. Bełtowska-Lehman**, P. Ozga, Z. Swiatek, M. Michalec, H. Pokhmurska: *Influence of bath additives on phase composition of corrosion-resistant Zn-Ni coatings*, Physico Chemical Mechanics of Materials: Problems of Corrosion and Corrosion Protection of Materials 2, (2004) 626-630.

2.

**E. Bełtowska-Lehman**, P. Ozga: *Electrodeposition of ZnTe thin films*, Archives of Metallurgy and Materials 50, (2005) 319-326.

3.

**E. Bełtowska-Lehman**, A. Rakowska: *Electrodeposition of high Mo content Ni-Mo coatings from citrate electrolytes*, Physico Chemical Mechanics of Materials: Problems of Corrosion and Corrosion Protection of Materials 5, (2006) 630-633.

4.

**E. Bełtowska-Lehman**: *Electrochemical deposition of selected alloys of transition metals from citrate electrolyte*, monograph, Ed. IMMS PAS, 2006, pp. 1-202.

5.

**E. Bełtowska-Lehman**: *Kinetics of induced electrodeposition of alloys containing Mo from citrate solutions*, Physica Status Solidi 5, (2008) 3514-3517.

6.

**E. Bełtowska-Lehman**, P. Indyka: *Electrodeposition and characterization of thin magnetic Ni-Fe films on copper substrates*, Archives of Metallurgy and Materials 53, (2008) 97-101.

7.

**E. Bełtowska-Lehman**, P. Indyka: *Characterization of Ni-Mo electrodeposition process*, Physico Chemical Mechanics of Materials: Problems of Corrosion and Corrosion Protection of Materials 7, (2008) 326-330.

8.

B. Major, **E. Bełtowska-Lehman**: *Projektowanie i wytwarzanie funkcjonalnych materiałów gradientowych*, Inżynieria Materiałowa XXIX, (2008) 47-48.

9.

A. Góral, J. Deda, **E. Bełtowska -Lehman**, B. Major: *Analysis of strengths, weaknesses, opportunities and threats (SWOT) and prerequisite tree (PT) of selected technologies for coating and layer production*, Archives of Metallurgy and Materials 53, (2008) 979-984.

10.

P. Panek, K. Drabczyk, H. Czternastek, E. Kusior, P. Zięba, **E. Bełtowska-Lehman**: *The influence of surface texture and temperature deposition of TiO<sub>2</sub> layer on crystalline silicon solar cells parameters*, Archives of Metallurgy and Materials 53, (2008) 103-106.

11.

**E. Bełtowska-Lehman**, *Fotowoltaika Fakty*, wyd. IMIM, 2008 (tłumaczenie na język polski i redakcja opracowania European Photovoltaic Technology Platform *PV Fact Sheets*

12.

B. Major, **E. Bełtowska-Lehman**, „Projektowanie i wytwarzanie funkcjonalnych materiałów gradientowych”, *Inżynieria Materiałowa XXIX*, (2008) 47 - 48.

13.

A. Góral, J. Deda, **E. Bełtowska-Lehman**, B. Major, *Analysis of strengths, weaknesses, opportunities and threats (SWOT) and prerequisite tree (PT) of selected technologies for coating and layer production*, Archives of Metallurgy and Materials 53 (2008) 979 - 984.

14.

P. Indyka, **E. Bełtowska-Lehman**, M. Faryna, K. Berent, *Microstructural and microchemical characterization of the nickel-based thin films prepared by electrodeposition*, Archives of Metallurgy and Materials 55 (2010) 421 - 427.

15.

A. Goral, **E. Beltowska-Lehman**, P. Indyka, *Structure Characterization of Ni/Al<sub>2</sub>O<sub>3</sub> Composite Coatings Prepared by Electrodeposition*,  
Solid State Phenomena 163 (2010) 64  
- 67.

16.

A. Goral, **E. Beltowska-Lehman**, *XRD investigations of electrodeposited Ni and Ni/Al<sub>2</sub>O<sub>3</sub> coating*  
, Inżynieria Materiałowa 3 (2010) 410 - 413.

17.

**E. Beltowska-Lehman**, A. Bigos, P. Indyka, L. Tarkowski, M. Kot, J. Morgiel, *Electrodeposition of nanocrystalline Ni-Mo coatings from citrate electrolyte solution*,  
Inżynieria Materiałowa  
□  
3 (2010) 369 - 372.

18.

P. Indyka, **E. Beltowska-Lehman**, A. Bigos, J. Morgiel, M. Kot, L. Tarkowski, *Optimization of galvanic bath composition and operating parameters for electrodeposition of Ni-W coatings*,  
Inżynieria Materiałowa  
□  
3 (2010) 377 - 381.

19.

M. Kot, **E. Beltowska-Lehman**, A. Bigos, P. Indyka, J. Morgiel, W. Rakowski, *Mechanical and tribological properties of electrodeposited Ni-Mo coatings*,  
Inżynieria Materiałowa 3 (2010) 373 - 376.

20.

A. Bigos, **E. Beltowska-Lehman**, P. Indyka, J. Morgiel, *Electrodeposition of nanocrystalline matrix Ni-Mo/Al<sub>2</sub>O<sub>3</sub> composites*,  
Composites 2 (2011) 157 - 162.

21.

M. Kot, **E. Bełtowska-Lehman**, A. Bigos, P. Indyka, J. Morgiel, S. Zimowski, *Właściwości powłok Ni-Mo nakładanych metodą elektrochemiczną*, Tribologia 235 (2011) 65 - 72.

22.

B. Major, **E. Bełtowska-Lehman**, A. Góral, J. Deda, *Scenariusze i strategie rozwoju technologii materiałów zaawansowanych*, rozdział w: *Scenariusze rozwoju technologii nowoczesnych materiałów metalicznych, ceramicznych i kompozytowych*, Wydawnictwo Naukowe Instytutu Technologii Eksploatacji - PIB, Radom, 2010, tom 2, 240 - 244.

23.

**E. Bełtowska-Lehman**, A. Bigos, P. Indyka, *Characterization of electrodeposited nanocrystalline Ni-Mo protective coatings*, Physico-chemical Mechanics of Materials 8 (2010) 324 - 329.

24.

L. Tarkowski, P. Indyka, **E. Bełtowska-Lehman**, XRD characterisation of Ni-based coatings prepared by electrodeposition, Nuclear Instruments and Methods in Physics Research Section B 284 (2011) 40 - 43.

25.

**E. Bełtowska-Lehman**, Europejska Platforma Technologiczna Fotowoltaiki, Fotowoltaika 3 (2011) 23 - 25.

26.

**E. Bełtowska-Lehman**, A. Bigos, P. Indyka, M. Kot, Electrodeposition and characterisation of nanocrystalline Ni-Mo coatings, Surface and Coatings Technology 211 (2012) 67 - 71.

27.

**E. Bełtowska-Lehman**, P. Indyka, A. Bigos, M. Kot, L. Tarkowski, Electrodeposition of nanocrystalline Ni-W coatings strengthened by ultrafine alumina particles, Surface and

Coatings Technology 211 (2012) 62 - 66.

28.

**E. Beltowska-Lehman**, P. Indyka, Kinetics of Ni-Mo electrodeposition from Ni-rich citrate baths, Thin Solid Films 520 (2012) 2046 - 2051.

29.

**E. Beltowska-Lehman**, A. Goral, P. Indyka, Electrodeposition and characterization of Ni/Al<sub>2</sub>O<sub>3</sub> nanocomposite coatings, Archives of Metallurgy and Materials 56(4) (2011) 919 - 931.

30.

A. Bigos, **E. Beltowska-Lehman**, P. Indyka, Microstructure and mechanical properties of nanocrystalline Ni-Mo protective coatings, IOP Conference Series: Materials Science and Engineering, 32 (2012) - IOP Conf. Ser.: Mater. Sci. Eng. 32 012002  
doi:10.1088/1757-899X/32/1/012002

31.

P. Indyka, **E. Beltowska-Lehman**, A. Bigos, Microstructural characterization of electrodeposited coatings of metal matrix composite with alumina nanoparticles, IOP Conference Series: Materials Science and Engineering, 32 (2012) - IOP Conf. Ser.: Mater. Sci. Eng. 32 012010 doi:10.1088/1757-899X/32/1/012010

32.

P. Indyka, **E. Beltowska-Lehman**, J. Morgiel, M. Bieda, Microstructure and deposition relations in alumina particle strengthened Ni-W matrix composites, Solid State Phenomena, 186 (2012) 234-238.

33.

A. Bigos, **E. Beltowska-Lehman**, P. Indyka, M.J. Szczerba, M. Kot, Electrodeposition and properties of nanocrystalline Ni-based alloys containing refractory metal obtained from citrate baths, Archives of Metallurgy and Materials 58(1) (2013) 247 - 253

34.

A. Bigos, **E. Bełtowska-Lehman**, P. Indyka, B. Kania, M.J. Szczerba, Ni-Mo alloys electrodeposited under direct current from citrate-ammonia plating bath, *Inżynieria Materiałowa* 3 (2013) 135 - 139.

35.

P. Indyka, **E. Bełtowska-Lehman**, L. Tarkowski, A. Bigos, E. García-Lecina, Structure Characterization of Nanocrystalline Ni-W Alloys Obtained by Electrodeposition, *Journal of Alloys and Compounds* 590 (2014) 75 - 79

36.

K.P. Mroz, A. Bigos, S. Kucharski, K. Dolinski, **E. Bełtowska-Lehman**, Ni-W Electrodeposited Coatings on Low Carbon Steel Substrate: Fatigue Observations, *Journal of Materials Engineering and Performance* 23 (2014) 3459 - 3466.

37.

B. Kania, P. Indyka, L. Tarkowski, **E. Bełtowska-Lehman**, X-ray diffraction grazing-incidence methods applied for gradient-free residual stress profile measurements in electrodeposited Ni coatings, *Journal of Applied Crystallography* 48 (2015) 71 - 78.

38.

**E. Bełtowska-Lehman**, P. Indyka, A. Bigos, M.J. Szczerba, M. Kot, Ni-W/ZrO<sub>2</sub> nanocomposites obtained by ultrasonic DC electrodeposition, *Materials and Design* 80 (2015) 1-11.



## Research Projects

### Projects from Ministry of Science and Higher Education

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*Influence of molybdenum addition on the corrosion-resistant properties of Ni-Cu alloys; development of the new type of electrolytic coatings* (Project No. KBN 3T08C 06328) IMMS PAS, supervisor, 2005-2007.

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*Designing and production of functionally graded materials* (Project No. PBZ-KBN 100/TO8-2003): Subject 1: Designing and technology elaboration of functionally graded materials for the application in photonics and fuel cells, Task 2: Elaboration of technology of antireflection gradient coatings in silicon solar cells, IMMS PAS, contractor, 2004-2007.

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*Development scenarios of modern technologies of metallic, ceramic and composite materials* (Project ForeMat No. WKP 1/1.4.5/2/2006/23/26/604): task: SWOT analysis and PT of coating production technologies, IMMS PAS, contractor, 2006-2008.

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*Ceramic and metal matrix composites and nano-composites for aviation and automotive industry-KomCerMet* (Project No. POIG.01.03.01-14-013/08), co-ordinator: Institute of Fundamental Technological Research, Task KCM3: *Nano-composites multifunctional coatings*, contractor, 2008 - 2013.

### Structural Funds

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*Ceramic and metal matrix composites and nano-composites for aviation and automotive industry-KomCerMet* (Project No. POIG.01.03.01-14-013/08), co-ordinator: Institute of Fundamental Technological Research, Task KCM3: Nano-composites multifunctional coatings, 2008 - 2013, supervisor of the tasks in the IMMS PAS.

### National Science Centre

*Nanocrystalline composite coatings Ni-W/ZrO<sub>2</sub> obtained by electrochemical deposition, as an alternative to toxic chromium coatings - preparation, characterization and functional properties*, NCN 2011/01/B/ST8/03974, 2011 - 2014, supervisor.

### **Experience gained abroad:**

France – Research Center of Chemical Metallurgy CNRS in Vitry, 1977 - 1998 (12 months)

India – Central Electrochemical Research Institute in Karaikudi, 1987 (3 weeks)

Italy – „La Sapienza” University in Rome, 1989 – 1992 (1 month)

France – PHASE Laboratory CNRS in Strasbourg, 1997- 2000 (2 months)

Italy – „La Sapienza” University in Rome, 1998, visiting professor (1 month)

**Prizes and awards:**

1979 - Ph.D. with honour

1982 - Prize from the President of the IV Division (Technical Sciences) of the Polish Academy of Sciences

2000 - Expert-Evaluateur for FP5

2006 - Nomination of the Ministry of Education and Science as the Polish representative to the Mirror Group of the European Technology Platform for Photovoltaics

2008 - Golden Cross of Merit for all the scientific activity

External expert of the National Foresight Programme POLAND 2020

2012 Expert of National Science Centre, panel ST8 (Physical Sciences and Engineering)

2012 Gold Medal for long service

### **Education of scientific staff**

#### Supervisor of PhD thesis:

mgr inż. Paulina Indyka, *Optimization of the microstructure and properties of Ni-W coatings deposited electrochemically*

mgr Agnieszka Bigos, *Effect of electrodeposition parameters on the properties of metallic Ni-Mo and nanocomposite Ni-Mo/Al<sub>2</sub>O<sub>3</sub> coatings*

#### Reviewer:

Electrochimica Acta, Surface and Coatings Technology, Journal of Applied Electrochemistry, Journal of the Electrochemical Society, Materials Chemistry and Physics Archives of Metallurgy and Materials, Ministry of Science and Higher Education and Foundation for Polish Science.

### **Organisation of conferences and scientific events**

Member of organizing committees: International Conference on Phase Diagram Calculation and Computational Thermochemistry CALPHAD XXXIII, Kraków (2004), Symposium on Texture

and Microstructure Analysis of Functionally Graded Materials SOTAMA-FGM, Kraków (2004),  
Workshop on Progress in Microstructure Characterization by Electron Microscopy MicroCEM,  
Zakopane (2005),  
Texture Workshop, Kraków (2006),  
Symposium on Texture and Microstructure Analysis of Functionally Graded Materials  
SOTAMA-FGM, Kraków (2007)

Co-chairman of AMT2010 Conference (Advanced Materials and Technology), Zakopane  
2010

Member of Scientific Board of II National Photovoltaic Conference, Krynica 2011

Guest Editor: Archives of Metallurgy and Materials (2006, 2008)

### **Membership in professional societies**

Member of Scientific boards of the Institute of Metallurgy and Materials Science of the Polish  
Academy of Sciences

### **Main scientific interest**

Fundamental and technological aspects of the electrodeposition of metals, alloys and composites of enhanced tribological and corrosion properties from aqueous complex plating baths. Processes of electrocrystallization. Modern methods of materials characterization. Protective coatings. Renewable energy sources. Photovoltaics. Electrodeposition and micromechanical properties of nanocomposite coatings with a metallic matrix containing the addition of refractory metal reinforced by ceramic particles