

## CURRICULUM VITAE (November, 2022)

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**Name:** György (George) KAPTAY

**Nationality:** Hungarian

**Date of birth:** 2 March, 1960

**Place of birth:** Tatabánya, Hungary

### **Educational background:**

Sep 1966 – Jun 1974: Elementary school of 8 grades at Almasfuzito-felso, Hungary

Sep 1974 – Jun 1978: Gymnasium of 4 grades at Komarom, Hungary

Sep 1978 – Feb 1984: Student at the Polytechnic Institute of Leningrad, Russia

Sep 1984 – Aug 1987: Ph.D. student at the Polytechnic Institute of Leningrad, Russia

### **Degrees obtained:**

1984: Diploma Engineer in Metallurgy of Non-Ferrous Metals

1988: Candidate of Sciences (C.Sc.) in Metallurgy of Non-Ferrous Metals (Russian Academy of Sciences)

1988: Doctor Universitatis (Dr. Univ) (University of Miskolc, Hungary)

1997: Ph.D. (University of Miskolc, Hungary)

1999: Dr. habil (University of Miskolc)

2005: D.Sc. (Hungarian Academy of Sciences)

2016: Corresponding member of the Hungarian Academy of Sciences

2022: Full member of the Hungarian Academy of Sciences

**Languages:** Hungarian (mother tongue),  
Russian (1984 proficiency level),  
English (1992 proficiency level).

**Posts:** Mar -Aug 1984: Research Fellow at ALUTERV-FKI (Hungarian Research Institute of Non-Ferrous Metals, Budapest)

Nov 1987 - Jun 1988: Engineer at the University of Miskolc (UM), Department of Physical Chemistry (DPC)

Jul 1988 - Jun 1989: Research fellow at UM, DPC

Jul 1989 – Jun 1994: Assistant Professor at UM, DPC

Jul 1994 - Jun 1999: Associate Professor at UM, DPC

since 1999 till present day: full Professor at UM, DPC (08.2006 – 10.2013: part-time)

Jul 1996 - Jun 2004: Head of Department of Physical Chemistry at UM

Jul 1996 - Nov 1998: Director of Institute of Chemistry at UM

Nov 1998 - Jun 2006: Dean of the Faculty of Materials Science and Engineering

Jul 2003 - Jun 2004, Head of Department of Metalforming at UM (as a Dean)

Jul 2006: Founding director of the Research Institute for Nanotechnology BAY-NANO within the Bay Zoltan Public Foundation for Applied Research (at Miskolc, Hungary)

Since Jul 2006: Head of the Department of Nano-composites at BAY-NANO (December 2007 – Dec. 2011: Vice-director on scientific affairs of BAY-NANO, December 2010 – December 2011: the same in BAY-LOGI, since December 2010: Head of Group on Nanomaterials at BAY-LOGI, since September 2011: Head of Department of Nanomaterials at BAY-LOGI, since January 2015: Head of Research Group on Structural and Functional Materials at BAY-ENG, since January 2016: Head of Department of Materials Development, since March 2018: senior researcher at BAY-ENG)

2007-2013: Head of the Department of Nanotechnology within the University of Miskolc

Since 2013: PI on nanosciences and nanotechnology of the University of Miskolc.

**Business experience:** international metal trader 1991 – 1998.

**Study tours, visiting professorships (more than a week per site):**

- i. IONH – Research Institute of the Academy of Sciences of Ukraine, Kiev (3 \* 2 weeks between 1990 – 1992);
- ii. The University of Alabama, USA (3 months in 1991);
- iii. University of Catania, Italy (2 weeks, 1996);
- iv. Marseille and Grenoble Polytechnic, France (2 weeks, 1997);
- v. Kyushu Institute of Technology, Japan (1 month, 2002);
- vi. Kyushu Institute of Technology, Japan (1.5 months, 2003);
- vii. Swinburne University of Technology, Melbourne, Australia (1 month, 2007)
- viii. Swinburne University of Technology, Melbourne, Australia (3 weeks, 2011)
- ix. Central South University of China, Changsha, Hunan, China (1 month, 2019)

**Short visits:** more than 100 in Europe, Americas and Asia

**Management of the teaching process:**

- as a professor: development of the subject “Physical Chemistry” (1993 – 2007), “Equilibrium of Materials”, “Theory of Phase Diagrams”, “Interfacial Phenomena” and “The Art of Doing Science” (since 2007) for the course in Materials Engineering within the University of Miskolc, Hungary + introduction of courses on “Nanotechnology” at BSc, MSc and PhD levels into the course on materials engineering at the University of Miskolc, Hungary (since 2008).
- as a dean of faculty: transition from the historical Faculty of Metallurgical Engineering (established in 1735 by queen Maria Teresia) to the Faculty of Materials Science and Engineering, with opening a new Department for Ceramic Materials and a new Department for Polymer Materials, and merging smaller traditional departments on Metallic Materials (1998 – 2006),
- as a “scientific politician”: leadership in transition of the Hungarian higher education on materials science and engineering from the traditional 5-year system to the new, Bologna-system, i.e. development of state requirements + curricula + accreditation for BSc and MSc levels in Materials Science and Engineering courses for the whole country (Hungary) and its implementation at the University of Miskolc (2003-2005).

**Scientific management:**

- scientific leader of a research group of 3-20 people since 1992 (currently around 20).
- founding director of the BAY-NANO research institute on Nanotechnology, in Miskolc, Hungary (2006),
- founding head of Department of Nanotechnology at the University of Miskolc, 2008,
- president of the Hungarian Society of Materials (since 2013)
- president of the Scientific Council of the University of Miskolc (since 2017)
- president of the North-Eastern region of the Hungarian Academy of Sciences (since 2021)

**Courses held for undergraduate and graduate students of materials science and engineering:**

- i. Interfacial (nano-) phenomena in materials (BSc, MSc and PhD levels)

- ii. Equilibrium of materials (BSc and MSc levels)
- iii. The Art of Doing Science (PhD level)

**Supervisor** of 34 diploma works for **MSc degree**.

**Ph.D. degrees received under his supervision:**

- i. Sergei Devyatkin: Electrochemical Synthesis of Transition Metals' Diborides from Molten Salts; May 1997, University of Miskolc
- ii. Laszlo Tikasz: Aluminium Electrolysis – Feb 2001, University of Miskolc
- iii. Eniko Bader: Wettability of Ceramics by Liquid Metals – May 2001, University of Miskolc
- iv. Renata Roman: Removal of Zn from Fly Ash by Molten Salt Treatment – July 2001, Vree University of Brussels, in cooperation with dr. A.Buekens
- v. Jaroslav Sytchev: Synthesis of carbon nanotubes by electrolysis of molten salts – November 2006, in cooperation with prof. H.Khushkov
- vi. Olga Verezub: In-situ Laser Melt Injection of surface steel nano-composites – March 2007, in cooperation with prof. A.I.Grabchenko of the University of Kharkhov.
- vii. Tamas Gabor: Modification of carbon nanotubes – March 2008, in cooperation with prof. Erika Kálmán
- viii. Istvan Budai: Preparation of particles stabilized liquid metallic emulsions and monotectic alloys – June 2009
- ix. Peter Baumli: Perfect wettability by liquid aluminium and spontaneous synthesis of Al-matrix metal (nano-) composites – June, 2010
- x. Gabor Levai: Coloured hot dip galvanization by Zn-Ti – December 2013 (with T.I.Török as ex-supervisor).
- xi. Melinda Godzsak: Colouring hot dip galvanization by Zn-Mn. October 2017.
- xii. Dheeraj Varanasi: Phenomena upon brazing steels by liquid copper: January 2021 (with P.Baumli as co-supervisor).
- xiii. Adrienn Szalai: Synthesis of superparamagnetic nano-particles: January 2022 (with B. Fodor as co-supervisor)
- xiv. Czagány Máté: Development and characterization of nano-multi-layers: June 2022 (with P. Baumli as co-supervisor).

**Research interests:**

**i. Chemical Thermodynamics:** Measurement and Estimation of Thermodynamic Properties (bulk and surface) of Inorganic Phases and Alloys. Models for bulk and surface/interface properties. Evaluation of data and creation of databanks. Calculation of phase diagrams. Laws of thermodynamics (introduced the 4<sup>th</sup> law). Surface and interfacial phase transition. Modelling materials under the influence of neutron irradiation. Nano-thermodynamics (introduced nano-Calphad).

**ii. Surface Science:** topics, related to interfacial and other phenomena in systems containing liquid metals, solid metals, ceramic particles and bubbles (MMC, Amorphous MMC, Penetration phenomena, metallic foams, metallic emulsions, surface phase transition, Marangoni flow, grain boundaries, etc.)

**iii. Electrochemistry and Chemistry in Molten Salt Media:** Aluminum Electrolysis. Electrochemical Synthesis of Compounds (such as titanium diboride, etc.), coatings, powders and nano-tubes. Calculation of electrochemical synthesis diagrams. All-liquid batteries for the static storage of electrical energy.

**iv. Nanotechnology:** Electrochemical synthesis of carbon nanotubes and nanopowders from molten salts. Development of composite materials reinforced by nanoparticles and

nanopowders. Calculation of nano-phase diagrams (introduction of the nano-Calphad principle). Calculation of prewetting (more precisely: SPT = surface phase transition and GBST = grain boundary segregation transition) lines for phase diagrams. Optimization of cutting conditions of UFG metals. Stabilization of nano-grained alloys against coarsening and precipitation using segregation. Producing colored nano-layers on top of hot-dip galvanic layers. Development of low-melting point nano-multi-layered brazing alloys.

**v. Modeling thermophysical properties of liquid metals and alloys:** cohesive enthalpy, critical point, molar volume, volume thermal expansion coefficient, surface tension, interfacial energy, contact angle, viscosity, diffusion coefficient, heat conductivity.

**vi. Industrial application:** Physicochemical basis of metallurgical processes. Ladle metallurgy. Model for the LD converters. Cathode protection in Al electrolysis cells. Surface treatment of Al alloys. Joining (welding, soldering, brazing). Purification of metallurgical silicon. Metal matrix composites. Closed cell metallic foams (Al). Open cell metallic foams (Ni, Ti, Cu, Ag, Al). Metallic emulsions. Heat storage and heat transfer materials. Closed cell glass foams. Life-time models for terminals. Ultra-sound assisted creation of bubbles for Al foams. Effect of microwave on combustion of natural gas. Development of space materials. Energy production (LNG and biogas).

**vii. Metrology:** reform of the SI system (5 base units instead of 7). Reform of the new IUPAC table of atomic masses.

**viii. Scientometrics.** Measuring the scientific excellence of individuals. The criticism of the h-index. Introduction of a new hh-index (previously called k-index). The role of number of authors. The role of self-citations.

$h\text{-index}^1 = 31$  (based on my calculation and independent citations<sup>2</sup>),  $h = 26$  according to Scopus,  $h = 26$  according to Web of Science, Advanced Search,  $h = 32$  according to Google Scholars.

$dh/dt = 1/\text{year}$  between 2000 - 2012,  $dh/dt = 2$  since 2012.

Cumulative impact factor<sup>3</sup>: around 307,

Partial cumulative impact factor<sup>4</sup>: around 157,

Publications: 237 journal papers, 2 books, 15 book chapters, 122 proceedings papers + 29 other papers + 12 patents = 417 published items,

Scimago ranks (MTMT): 44 papers in different D1 journals + 40 papers in different Q1 journals + 54 papers in different Q2 journals + 11 papers in different Q3 journals + 6 papers in different Q4 journals = 155 papers in different D1-Q1-Q4 journals.

Cited papers: 238 (average 13.3 citations / cited paper), ratio of cited papers: 59.1 %.

Independent citations: around 4,000.

**Research grants:** total about 100 grants since 1989, for total about USD 100 million (in Hungary)

**Patents:** 12 patents filed; 11 in Hungary, including 4 extensions to EU, 2 extensions to USA, 1 extension to China and 1 extension to Russia + 1 Ukrainian patent.

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<sup>1</sup> The h-index is the number of papers, each with at least the same number of independent citations: see the following 28 papers, each with at least 27 independent citations (but not all of them with at least 28 citations yet) : J173, J171, J160, J153, J148, J146, J141, J140, J129, J117, J115, J112, J104, J102, J96, J95, J94, J90, J87, J84, J57, J48, J46, J11, P96, P79, P77, P41.

<sup>2</sup> Independent citations: none of the authors overlap in the citing and cited papers. Citations, published in any journal, proceedings, book chapters or Thesis count, except those Thesis, for which I am a supervisor.

<sup>3</sup> Cumulative impact factor = the sum of the impact factors of the journal in the year (except the last year, extrapolated from the data of the previous year) of publication of each given paper.

<sup>4</sup> Partial cumulative impact factor = the sum of the ratio of the impact factors of the journal in the year (except the last year, extrapolated from the data of the previous year) of publication of the given paper, divided by the number of authors of the same paper.

### **Membership and posts in professional bodies:**

- i. American Society of Materials (ASM) (membership No 153862)
- ii. The Minerals, Metals & Materials Society (TMS) (lifetime membership No 387470)
- iii. International Society of Electrochemistry (ISE)
- iv. The Electrochemical Society
- v. European Federation of Corrosion – (Hungarian delegate to the Working Party on Hot Gases and Combustion Products 1993-1996)
- vi. IUPAC Hungarian representative in Commission on Chemical Thermodynamics (1997-2000)
- vii. Representative of Hungary in APDIC since 2000,
- viii. Executive Officer of FEMS (2006-2011), President of the FEMS Award Committee (2008-2011) ((FEMS = European Federation on Materials Science))
- ix. Member of Hungarian Scholarship Board (MÖB, since 2008)
- x. Member of OTKA decision board (Metallurgical and Mechanical Sciences: 2008-2011, Electrical Sciences: 2012, ÉTTK: 2016-2022)
- xi. Hungarian Society of Mining and Metallurgy (OMBKE)
- xii. Eotvos Physical Society, Division of Thermodynamics
- xiii. Hungarian Academy of Sciences, Miskolc regional Division, Working group of Physical Chemistry (president 1996-2008)
- xiv. Academy of Sciences, Committee on Metallurgy (elected member since 1996)
- xv. Academy of Sciences, Subcommittee on Chemical Metallurgy (president 1999-2005, member since 2006)
- xv. President of Hungarian Society of Materials (MAE, since December 2013)
- xvi. Member of the Scientific Committee of HTC (High Temperature Capillarity) since 2014.
- xvii. Member of Board of Evaluation Committee for “Prize of Excellence for Women in Science”, 2016.
- xviii. Elected member of MAB (Miskolc Committee of the Hungarian Academy of Sciences) since 2014
- xix. President of the Committee on Materials Science of MAB (Miskolc Committee of the Hungarian Academy of Sciences) since 2014.
- xx. President of the North Eastern Chamber of Hungarian Academy of Sciences (since 2020)

### **Awards / Prizes received**

- i. Medal for Student’s Achievement, given by the Minister of Education, 1984
- ii. Young Scientist’s prize at ALUTERV FKI, 1985
- iii. prize of Foundation „for the development of Hungarian Engineering”, 1989
- iv. prize of Foundation „for the development of Hungarian Engineering”, 1990
- v. prize of Foundation „for the Hungarian Science”, 1992
- vi. prize for Scientific Achievement given by the Miskolc Chamber of the Hungarian Academy of Sciences, 1998
- vii. Acknowledgement for advisory work with Maziar S. Yaghmaee, a 5<sup>th</sup> year student who won Pro Scientia gold medal in 1999 for his research work, 1999
- viii. Rector’s acknowledgement for the development of the education of materials engineering at the University of Miskolc, 2005
- xvii. Order of Knighthood from the President of the Hungarian Republic, 2006
- xviii. “Best advisor” for students research work by the Dean of the Faculty of Materials Engineering of the University of Miskolc, November, 2010.

- xix. CALPHAD Best Paper Award for the best published manuscript in the CALPHAD Journal in the year of 2014 (pp.81-94). Received on 4<sup>th</sup> June, 2015 in Calphad conference, Loano, Italy.
- xx. Outstanding researcher of the University of Miskolc (September 2015)
- xxi. Excellence in Reviewing from Acta Materialia, 2016
- xxii. Recognition from the Rector for having 5 papers (4 of them single author papers) among the h = 67 of the Uni-Miskolc in 2017 and the same for 2018.
- xxiii. Recognition from the Rector for second highest independent citations in QS for University of Miskolc (2020)
- xxiv. Banki Donat Medal from the Faculty of Mechanical Engineering of the Budapest University of Technology (2021)
- xxv. Scientific medal “Otto Hermann” from the city of Miskolc, 2022.

**Membership of journals’ editorial boards / guest editor**

- Ions and Plasmas (Elsevier, 1998-2000)
- World of Materials (e-journal, since 2000)
- Journal of Mining and Metallurgy B (Bor, Serbia, member since 2002)
- Zhurnal Funkcionalnich Materialov (Russia, since 2006)
- Open Thermodynamic Journal (since 2008)
- Archives of Metallurgy and Materials (since 2012)
- J. Materials Science (Springer) – guest editor, 2010
- J Nanoscience Nanotechnology – guest editor, 2011
- J Mater Eng Performance – guest editor, 2013
- J. Nanoparticles, since 2017
- J Materials Science (Springer) – guest editor, 2020.

**Reviews:**

- 621 reviews for 150 international journals,
- 99 reviews for proceedings of international conferences,
- 114 reviews for scientific evaluation of individuals (PhD degrees, etc...)
- 234 reviews for research proposals
- Total 1,068 reviews.