



Professor Georges John Kipouros

Philosophy Doctor

Emeritus Professor and Dean, University of Saskatchewan, Saskatoon, Canada

Adjunct Professor, University of Waterloo, Ontario

Dalhousie University, Halifax, Nova Scotia

Biography

Georges John Kipouros, was educated at the National Technical University of Athens, Greece, graduating first in rank with a 5-year Diploma of Engineering in Mining and Metallurgical Engineering from the Department of Chemical Engineering. He then spent 3 years of military service as an Acting Head, Bureau of Studies, Permanent Committee for Receiving Ammunition, Greek Armed Forces, Athens, Greece in the rank of a second lieutenant. Georges immigrated to Toronto, Canada and subsequently graduated from the Graduate School of the University of Toronto, Toronto, Ontario, Canada, with a Master of Applied Science (M.A.Sc.) in Metallurgy and Materials Science. He also obtained a Doctor of Philosophy (Ph.D) in the same fields working with the late Dr. Spiro N. Flengas. The topic of his research was the electrorefining of zirconium metal from chloride and fluoride melts and the complete study of the electrolyte systems by determining the phase diagrams, x-Ray studies, measurements of the vapour pressures and electrochemical properties of molten salts. He also studied the separation of zirconium from hafnium by a high temperature process. The highlight was the successful electrorefining of zirconium metal in chloride-fluoride melts and the most accurate vapour pressure measurements of hexachlorocompounds of zirconium and hafnium important for their separation.

He started his career as a Post Doctoral Institute Research Associate, (with Dr. Donald R. Sadoway), Department of Materials Science and Engineering; Massachusetts Institute of Technology, Cambridge Massachusetts (1982-1985). The research work at MIT was related to the investigation of the electrodeposition of aluminum and magnesium by Raman spectroscopy at temperatures of industrial practice. Streamers and complex formations were identified. Work was conducted on the electrodeposition of molybdenum metal on graphite from chloride melts. The electrodeposition was successful and a thick deposits of cm size were achieved. Prior to electrolysis the melts were characterized by determining the relevant phase diagrams and detail electrodeposition mechanisms. The highlight of his research at MIT was the writing of the chapter "The chemistry and electrochemistry of magnesium production" which explained the unknown at that time process of Norsk Hydro based only on theoretical calculations using existing and predicted thermodynamic data. Other subjects of research were on lithium production. It was at that time that the reputation of the Sadoway's group attracted attention and a two-day short course at TMS on molten salts was initiated that spanned for more than ten years.

His industry research career followed that of MIT by a position of Senior Research Scientist, Department of Physical Chemistry, General Motors Research and Development Center, Warren, Michigan, USA (1985-1989). He was recruited to lead in the use of molten salt process to produce neodymium-iron alloy which constitutes the base for the production of the neodymium-iron-boron

permanent magnets for the innovative switched reluctance and permanent magnet motors. He designed and conducted scale-up experiments to determine the parameters necessary for technology transfer, developed methods for regenerating and recycling the reactants and treating the by products. He transferred successfully the process to the plant of MAGNEQUENCH SBU in Anderson, Indiana.

Kipouros returned to Canada in 1989 as a tenured Associate Professor and Chair of the Metallurgical Engineering program in the Department of Mining and Metallurgical Engineering at the Technical University of Nova Scotia (TUNS) in Halifax, Nova Scotia. His research activities continued in the field of molten salts and slags by measuring viscosities relevant to steelmaking and extending his research interests in corrosion and powder metallurgy. He provided consulting to small and large international corporations in the fields of his research interests. He was invited (1995-1996) by the Department of Physics, General Motors Research and Development Center, Warren, Michigan to spend his first sabbatical leave of absence as a Faculty Consultant, Corporate Magnesium Center, to lead in the development of a new process to produce high purity magnesium for automobile manufacturing. This relation continued for many more years as it also involved directed efforts to transfer the process to the industrial plant by partnership with an aluminum producer and also evaluation of alternative processes for the production of magnesium chloride.

In the academic field he became full professor and Head (1994-2000) of the Department of Mining and Metallurgical Engineering at TUNS and he was instrumental in achieving a smooth transition when TUNS amalgamated, by the government of Nova Scotia, with Dalhousie University. He was elected Vice-Chair (1997-2000), Dalhousie University Senate, Halifax, N.S. which is the governing academic body of the university. Other academic appointments include Assistant/special Dean of Engineering with responsibilities of preparation of engineering education accreditation for the 6 associated universities and renovating/design the new campus, organize satellite campuses.

Director, Minerals Engineering Centre, Dal, Halifax, N.S (2000-2013) with responsibilities included the fiscal and administrative matters of the centre and providing leadership in a wide variety of research and service activities related to resource and minerals industries. Focus was on expanding the research activities of the centre in the areas of materials, offshore drilling, environmental and power generation sectors.

Dean and Professor, College of Engineering (2013-2016) University of Saskatchewan, Saskatoon, Saskatchewan with goals to diligently and strategically invigorate the college in terms of academic accreditation and expand the research into other fields including the utilisation of the national synchrotron facility. Presently Georges Kipouros is Emeritus Professor and Dean, Chemical and Biological Engineering, University of Saskatchewan, Adjunct Professor, Department of Mechanical Engineering and Mechatronics, Dalhousie University, and Adjunct Professor, Department of Mechanical Engineering, Waterloo University.

He is also Vice General Manager of R&D, the equivalent of Vice-President of Research and Development of a western industry, Zhejiang Kangpurui Auto Parts Co., Ltd., as a result of a 10-year Visa R of the Peoples Republic of China as a recognition of High Level Foreign Talents. He awaits to begin his duties when the Covid-19 allows.

In 2017 he was Project Professor, Institute of Industrial Science (IIS), University of Tokyo

Other research visits include:

(1993) *Visiting Professor*, Department of Chemical Engineering & Institute of Chemical Engineering and High Temperature Chemical Processes, University of Patras, Patras, Greece.

Visiting Professor, Institute of Inorganic Chemistry, Norwegian Institute of Technology, University of Trondheim, Trondheim, Norway.

1998-2001 Faculty Consultant, Mehran University of Engineering and Technology, Jamshoro, Sindh, Pakistan,

2002-2003 *Visiting Professor*, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, 1,1 Katahira, 2-Chome, Aobaku, Sendai 980-8577, Japan

Despite of his academic higher administration involvement, consulting engagements and research visits Dr. Kipouros has an uninterrupted research support until 2023 from Natural Sciences and Engineering Research Council (NSERC) in Canada. This is due to the initiation of innovative research in areas that previous researchers were unsuccessful or left unexplored due to research difficulties. The most prominent areas of research were: powder metallurgy beyond the copper, stainless steel and zinc; electroless plating of difficult to plate metals; electrolytic problems such as unwanted passivation (copper production) and high temperature measurements of viscosity of slags.

In the field of powder metallurgy previous researchers tried to apply the existing techniques of high purity powders of aluminum and concluded correctly that conventional sintering pure aluminum powders cannot be achieved because of the instantaneous passivation of pure aluminum. However, the philosophy of the research group under Dr. Kipouros attempted and successfully developed sintering of aluminum containing small amounts of magnesium which breaks the passivation layer of aluminum oxide and allowed the sintering under conventional conditions. Detail studies of other useful elements can be added providing that do not change drastically the advantage of aluminum, being light weight, and do not increase the sintering temperature requirement. The first Ph.D. student to do this, Professor Paul Bishop, was hired by GKN Sinter metals and after a successful long research career in the industry, which resulted in the production of millions aluminum parts for the automotive sector, he returned to Dalhousie University as a faculty member. Many more Ph.D. students were trained on the topic and are working in academic or industrial places.

A similar approach was followed in the powder metallurgy of magnesium metal which does not passivate and the additions to eliminate passivation products lie in the group of the rare earth elements that the powder producing manufacturers had no ways to produce the necessary starting materials. The project of the magnesium sintering was led by a Ph.D. student, Dr. Paul Burke, and many more students using filling of calcium metal to prove the correctness of the idea to sinter magnesium metal. Dr. Burke continued his research at MIT and to Digital Alloys.

Three more research directions were investigated: the passivation of copper cathodes in the production of pure copper; the aqueous corrosion of cermets and the electroless coating of difficult to plate metals. In the passivation of the copper cathodes it was discovered that the passivation was caused by the presence of nickel in the electrolyte. The research was led by a Ph.D. student Dr. George Jarjoura now a professor at Dalhousie University. Industry responded favorably to the discovery and every copper production plant contains a nickel removal unit. The electroless plating was initiated by Dr. Nazila Dadvand presently Director, Coatings division, Texas Instruments.

Awards and Citations

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| 2016 | Canadian Academy of Engineering Fellowship Award, FCAE |
| 2016 | Canadian Institute of Mining, Metallurgy and Petroleum Fellowship Award, FCIM |
| 2013 | Life member, Engineers Nova Scotia |
| 2010 | CIM Distinguished Lecturer |
| 2007 | Japan Society for Promotion of Science (JSPS/NSERC Award), Invitation Fellowship, 2007, 2017 |

2007 20th Canadian Metal Chemistry Award, MetSoc of CIM, 2007

2004 Best CIM Paper in *CMQ 2004*

1994 Best Reactive Metals Paper in *Light Metals '93*

Cited in: Canadian Who's Who American Men & Women in Science

EXPERIENCE: INTERNATIONAL

2017 **Visiting Professor**, International Center for Sustainable Materials, Institute of Industrial Science, the **University of Tokyo**.

2007 **Japan Society for the Promotion of Science, Fellowship, Visiting Professor**, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, 1,1 Katahira, 2-Chome, Aoba-ku, Sendai 980-8577, Japan; Institute of Industrial Science, The University of Tokyo, Tokyo, Japan; Space Energy and Resources, Kyoto University, Kyoto, Japan.

2006-present **Foreign Cooperative Researcher**, International Research Center for Sustainable Materials, Institute of Industrial Science, The University of Tokyo, Tokyo, Japan.

2002-2003 **Visiting Professor**, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, 1,1 Katahira, 2-Chome, Aoba-ku, Sendai 980-8577, Japan.

2001-2005 **Technical Advisor**, Canadian International Development Agency (CIDA), "Boiler Emission Upgrade Project", partnership between a consortium of Dalhousie University/GRI Research and CIDA to improve the efficiency and environmental performance of existing boilers in India. Budget of \$2,500,000.

1998-2004 **Advisor**, NATO Science for Peace Program, 971858, "Improvement of the Technological Parameters in the Electrochemical Production of Mg-Nd Alloys from oxyfluoride media (Hitech Alloys", a partnership involving, FORTH (Greece), IMNR (Romania), NEFERAL (End-User Romania), GIREDMET (Russia). A project budgeted for \$2,500,000.

1998-2005 **Faculty Consultant**, Mehran University of Engineering and Technology (MUET), Jamshoro, Sindh, Pakistan. At the invitation of Vice-Chancellor, Dr. Memon, I visited MUET and helped solidify the scientific collaboration of two institutions, namely MUET and Pakistan Steel, and I initiated graduate students exchange between MUET and DalTech. I remain a faculty consultant for MUET and we now plan to expand the collaboration in other than metallurgical areas of research.

1995-1996

Faculty Consultant, Corporate Magnesium Center, General Motors Research and Development Center, Warren, MI 48090, USA

PROFESSIONAL INVOLVEMENT

(i) SPECIAL PROFESSIONAL DEVELOPMENT CONTRIBUTIONS 2 day short courses.

- 1994 G.J. Kipouros and D.R. Sadoway, "**Molten Salts: Chemistry and Practice**", **TMS Tutorial Luncheon Lecture**, February 28, 1994, TMS Annual Meeting, February 27-March 2, 1994, Moscone Center-San Francisco, California.
- 1995 G.J. Kipouros and D.R. Sadoway, "**Molten Salts: Fundamentals and Industrial Applications**", TMS Short Course, Sponsored by Light Metals Division, February 11, 1995, TMS Annual Meeting, Las Vegas, Nevada.
- 1996 G.J. Kipouros, "**Magnesium Industrial Practice**", A week long course to Professionals and Managers at General Motors Research and Development Center, Warren, Michigan.
- 1997 G.J. Kipouros and D.R. Sadoway, "**Molten Salts: Fundamentals and Industrial Applications**", TMS Short Course, Sponsored by Light Metals Division, February 3, 1996, TMS Annual Meeting, Anaheim, California.
- Evaluation of the short course material and presentation by the attendees was the highest ever reported in the TMS Short Course history.
- 1998 G.J. Kipouros and D.R. Sadoway, "**Molten Salts: Bath Chemistry and Process Design in Aluminum, Magnesium and Lithium** ", TMS short course, sponsored by Light Metals Division, February 14, 1998. TMS Annual Meeting San Antonio, Texas
- 1999 G.J. Kipouros and D.R. Sadoway, "**Molten Salts: Bath Chemistry and Process Design in Aluminum, Magnesium and Lithium** ", TMS short course, sponsored by Light Metals Division, February 27, 1999. TMS Annual Meeting, San Diego, California.
- 2000 G.J. Kipouros, D.R. Sadoway, and C. Edward Eckert, "**Molten Salts Chemistry and Process Design: from Smelter to Foundry**" TMS short course, sponsored by Light Metals Division, March 11-12, 2000 , 129th TMS Annual Meeting, in Nashville, Tennessee.
- 2007 G.J. Kipouros "**Molten Salt Chemistry and Process Design in Aluminum, Magnesium, Calcium and Lithium Production**". A two day short course organized by the University of Tokyo for professionals and executives from industry, October 2007.

RESEARCH SUPERVISION SUMMARY

- 50 Undergraduate Student Research Assistants
- 38 Master Students
- 19 PhD Students
- 6 Visiting Professors