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PhD / Research Director

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Websites (non-updated):

(a) National Hellenic Research Foundation: <http://www.eie.gr/index-en.html>

(b) Institute of Biology, Medicinal Chemistry and Biotechnology:

http://www.eie.gr/nhrf/institutes/ibmcb/index-en_ibmcb.html

(c) Organic and Organometallic Chemistry Group:

<http://www.eie.gr/nhrf/institutes/iopc/researchgroups/ooc-group/ooc-group-en.html>



Curriculum Vitae – Current Research Interests

Education

- 1991: PhD in Chemistry, National and Kapodistrian **University of Athens**, Greece
PhD Thesis (with Dr. C.G. Screttas, National Hellenic Research Foundation):
“Metal alkoxide modified organolithium reagents. Synthesis and stabilization of
substituted lithioxyalkylolithiums including the aza-analogues, in tetrahydrofuran,
in the presence of magnesium 2-ethoxyethoxide” (in Greek)
- 1986: Degree in Chemistry, Aristotle **University of Thessaloniki**, Greece
Prize for the excellent University students, State Scholarships Foundation
Undergraduate Thesis in Chemistry: “1,3-Dipolar cycloaddition of nitrile oxides
to 2,6-dibenzylidenecyclohexanone” (in Greek)

Appointments

- 1996-present: Researcher (Research Director since 2007), **National Hellenic
Research Foundation**, Institute of Organic and Pharmaceutical
Chemistry (renamed to Institute of Biology, Medicinal Chemistry and
Biotechnology in 2012 as a result of the merger with the Institute of
Biological Research and Biotechnology of the NHRF), Athens, Greece
- 2015-present: Visiting Professor, **University of Thessaly**, Department of Biochemistry
and Biotechnology, Larissa, Greece

- 5-8/2007: Visiting Researcher, **Max-Planck-Institut für Kohlenforschung** (Reetz's group), Mülheim an der Ruhr, Germany
- 1995-1996: Post-doctoral Fellow with Prof. Dr. M.T. Reetz/Director, **Max-Planck-Institut für Kohlenforschung**, Mülheim an der Ruhr, Germany
- 1994-1995: Post-doctoral Fellow with Prof. Dr. F. Bickelhaupt/Director (passed away on 30/12/2013), **Vrije Universiteit** (Free University), Amsterdam, The Netherlands

Current Research Interests

1. *Transition metal homogeneous catalysis in organic synthesis*
 Development of novel phosphane- and phosphane-free ligands, complexation with transition metals (e.g. Ru, Rh, Pd, Pt), investigation of the coordination mode in the complexes and their evaluation as homogeneous catalysts in organic reactions (e.g. hydroformylation, hydrogenation, Heck and Suzuki couplings), at room temperature, under conventional heating or a microwave irradiation. Asymmetric catalysis and catalysis in aqueous media are included.
2. *Catalysis by metal nanoparticles*
 Development of new metal nanoparticles stabilized with organic molecules and applications as recyclable catalysts in the Suzuki reaction and the hydrogenation of unsaturated aldehydes.
3. *Dendrimer chemistry*
 Synthesis of new dendrimers and bioapplications.
4. *Medicinal chemistry*
 Synthesis of bioactive organic and organometallic compounds and investigation of their bioactivity as potent drugs against diseases (e.g. diabetes type-2, cancer).

More details are given in a following section.

Commercial products

It is pointed out that I was not involved on the commercialization of the following chemical. For the first time, we evaluated this type of ligands in Pd-catalyzed coupling reactions in air and we published the synthesis of the catalyst and the catalytic results in a scientific journal (see below). The companies proceeded to the commercialization of the catalyst.

➤ *Salicylaldehyde thiosemicarbazone palladium(II) chloride (CAS No.: 219954-63-9)*

Reference: Kostas, I.D. et al. Tetrahedron Lett. 46 (2005) 1967

Description: catalyst used for the Suzuki reaction under aerobic conditions

SIGMA-ALDRICH (Product No.: 674125); SANTA CRUZ (Product No.: sc-253529); American Custom Chemicals Corporation (Product No.: CHM0157495); Catalyz Pharma Co., Ltd. (Product No.: 8790); ENERGY CHEMICAL (Product No.: 674125); Shanghai Hanhong Chemical Co., Ltd. (Product No.: RA10460092); Chengdu Ai Keda Chemical

Technology Co., Ltd. (Product No.: 104729); ABI (Product No.: AC2A01FOP); ChemDBPortal (Product No.: CDBP225501); ALPHA CHEMISTRY; Haihang Industry Co., Ltd.; Jinan Haohua Industry Co., Ltd.; Angene International Ltd.; Jinan Great Chemical Industry Co., Ltd.; Huiju Chem Co., Ltd.; Tractus Company Ltd.; and more ...

Highlights of our research activities

- ❖ First use of **metalloporphyrins** as catalysts in the Suzuki reaction and the hydrogenation of trans-cinnamaldehyde – recyclable catalysts in aqueous media (Tetrahedron Lett. 2007, 48, 6688; Eur. J. Inorg. Chem. 2011, 4709).
- ❖ **Me-ANILAPHOS**: a highly versatile chiral ligand for the Rh-catalyzed asymmetric olefin hydrogenation (Tetrahedron Lett. 2006, 47, 7947). Selected comments: (i) "excellent catalyst" (a critical review: L. Eberhardt, D. Armspach, J. Harrowfield, D. Matt Chem. Soc. Rev. 37 (2008) 839); (b) "highly versatile ligand class" (ALDRICH: D. Amoroso et al. Aldrichimica Acta 41 (2008) 20). The publication "Kostas, I.D., et. al. Tetrahedron Lett., 2006, 47, 7947" for Me-AnilaPhos in asymmetric hydrogenation is cited in a patent: Publication number DE102007059298 A1, Inventors Matthias Eggenstein, Francio Giancario, Walter Leitner, Applicant Rheinisch-Westfälisch-Technische Hochschule Aachen.
- ❖ Pioneers on the use of **thiosemicarbazones** as ligands in the Pd-catalyzed coupling reactions in air (Tetrahedron Lett. 2004, 45, 2923; Tetrahedron Lett. 2005, 46, 1967; Tetrahedron Lett. 2006, 47, 4403). It has been included in HIGHLIGHTS for the field "Transition Metals in Organic Synthesis": B.C.G. Söderberg Coord. Chem. Rev. 2006, 250, 2411. One of our Pd complexes is currently commercially available by at least 20 companies including SIGMA-ALDRICH.
- ❖ First use of a **hemilabile amino- and sulfur-containing phosphinite** as efficient ligand in the Pd-catalyzed Heck reaction (Tetrahedron 2003, 59, 3467). It has been included in HIGHLIGHTS for the field "Transition Metals in Organic Synthesis": B.C.G. Söderberg Coord. Chem. Rev. 2006, 250, 300.
- ❖ First use of **non cyclic-amino bisphosphinites** as efficient ligands in the Rh-catalyzed hydroformylation (J. Organomet. Chem. 2001, 626, 221).

Honours, awards, distinctions, fellowships

- One of our metal complexes as an efficient catalyst for the Heck and Suzuki reaction in air is/was **commercially available** (CAS No.: 219954-63-9) by at least 20 companies, including SIGMA-ALDRICH (Product No.: 674125) with the following reference in the catalogues of several of the companies: Kostas, I.D. et al. Tetrahedron Lett. 46 (2005) 1967.
- Editorial Advisory Board: "Journal of Chemistry" (2012-present), "Conference Papers in Chemistry" (2012-2015), "Dataset Papers in Chemistry" (2012-2017, closing),

- “ISRN Organic Chemistry” (2010-present; renamed to “International Scholarly Research Notices” in 2014), “The Open Natural Products Journal” (2009-2015), “Journal of Medicinal Chemistry & Toxicology” (2016-present).
- 2009-2013: Member of the Management Committee in the COST action CM0802: European Phosphorus Sciences Network (PhoSciNet).
 - 2008: “Leonidas Zervas” Prize in Organic Chemistry (5/3/2008): K.A. Vallianatou for her PhD Thesis in “Asymmetric Catalysis” supervised by I.D. Kostas.
 - 2008: Comments by third parties for the highly efficient chiral ligand known as Me-AnilaPhos developed by Kostas for the asymmetric hydrogenation: (i) “excellent catalyst” (a critical review: L. Eberhardt, D. Armspach, J. Harrowfield, D. Matt Chem. Soc. Rev. 37 (2008) 839); (b) “highly versatile ligand class” (ALDRICH: D. Amoroso et al. Aldrichimica Acta 41 (2008) 20).
 - Recognition as pioneer on the use of (i) non cyclic-amino bisphosphinites as efficient ligands in the Rh-catalyzed hydroformylation; (ii) thiosemicarbazones as ligands in the Pd-catalyzed coupling reactions, and (iii) metalloporphyrins as catalysts in the Suzuki reaction and the hydrogenation of unsaturated aldehydes, as indicated by papers reported by third parties.
 - Named references to Kostas’ work in a number of papers reported by others, such as “Kostas and co-workers first reported ...”.
 - Keynote speaker in scientific meetings and invited speaker in Universities and Research Institutes.
 - Invited author for original articles, reviews and book chapters.
 - Invited reviewer for proposals and fellowships within National, European and American programmes, e.g. State Scholarships Foundation, General Secretariat of Research and Technology, COFUND (FP7), ACTS–ASPECT (Dutch Research Council NOW), Portuguese Foundation for Science and Technology (FCT), American Chemical Society Petroleum Research Fund.
 - Invited reviewer for a number of papers (as well as Editor in Chief or Special Issue Guest Editor) by 43 scientific journals.
 - Parts of our work have been included in HIGHLIGHTS for the field “Transition Metals in Organic Synthesis”.
 - 1999: Fellowship from TMR programme (E.U.) for participation on the “2nd Summer School on Green Chemistry”, Venice (Italy), September 6-12, 1999.
 - 1994-1996: Post-doctoral Fellowships, Human Capital and Mobility Programme.
 - 1987-1991: Doctoral Fellowship, National Hellenic Research Foundation.
 - 1985: Prize for the excellent University students, State Scholarships Foundation.

Teaching and Supervision Experience

- Coordinator of the training seminar "Contemporary Organic Chemistry and Applications" for high school teachers, Athens, May 1998.
- Courses in "Transition-metal homogeneous catalysis. Applications to organic synthesis" within the EST Marie Curie "EURODESY" (2006-2010).
- Courses at the MSc programme "Bio-entrepreneurship" (2015 – present). Topic of the courses: "Dendrimers and Bioapplications".
- Supervisor of undergraduate, MSc, PhD students and Post-docs.
- Keynote speaker in: (a) the educational event SCIENCE in SOCIETY, Athens, 12 December 2011; (b) Workshop "Chemistry and Research Challenges" for undergraduate and graduate students, Athens 23-24/4/2013; (c) educational event for the general public "Green Chemistry", Athens, 11 & 18 March 2014; (d) educational workshops, e.g. "Targeted Drug Discovery Workshop", Athens, 10-14 October 2016.
- Keynote speaker and head in educational chemistry experiments under specific cultural events for school children and for the general public, e.g. (a) "Chemistry, our life, our future", NHRF – 27/2/2011; (b) "Sunday Mornings", NHRF – 20/11/2011; (c) "Science and Technology Festival 2012", NHRF, 13-16/12/2012; (d) 1st Athens Science Festival (30/4-4/5/2014), Technopolis Municipality of Athens, (e) "Green Chemistry, a Growing Environmental Need", interview in Tech Talks Central, 27/6/2015, (f) 3rd Athens Science Festival (5-10/4/2016), Technopolis Municipality of Athens, etc.
- "Researcher's Night": NHRF–28/9/2012; Demokritos–27/9/2013, NHRF–12/9/2014 (Athens).

Membership of Scientific Societies

(i) Association of Greek Chemists; (ii) Association of Greek Researchers; (iii) American Chemical Society (1998-2014); (iv) Editorial Advisory Board "The Open Natural Products Journal" (2009-2015), "ISRN Organic Chemistry" (renamed to "International Scholarly Research Notices") (2010-present), "Dataset Papers in Chemistry" (2012-2017; closing), "Journal of Chemistry" (2012-present), "Conference Papers in Chemistry" (2012-2015); "Journal of Medicinal Chemistry & Toxicology" (2016-present), (v) Member of the Management Committee (2009-2013) of the COST action CM0802: European Phosphorus Sciences Network (PhoSciNet).

Lectures/Oral Presentations in Universities, Research Institutes, Conferences (including those as invited speaker)

22nd Hellenic Chemistry Conference, Thessaloniki 2-4 December **2016**; Athens International Catalysis Symposium 2016 (AICS 2016), 3–4 November **2016**; Targeted

Drug Discovery Workshop (Dendrimers: synthesis, properties & biomedical applications), National Hellenic Research Foundation, 12 October **2016**; 3rd Athens Science Festival (The magic of chemistry and its contribution to a sustainable development), 6th April **2016**; 12th Greece-Cyprus Conference, Thessaloniki 8–10 May **2015**; National Hellenic Research Foundation (The Contribution of Chemistry to a Sustainable Development - lecture to the general public), Athens 27th January **2015**; 4th Hellenic Symposium "Green Chemistry and Sustainable Development", Ioannina, 30 October – 1 November **2014**; 20th International Conference on Phosphorus Chemistry (ICPC 2014), Dublin, Ireland, 28th June – 2nd July **2014**; 1st Athens Science Festival (Green Chemistry), 4th May **2014**; National Hellenic Research Foundation (Green Chemistry – lecture to the general public), Athens 18th March **2014**; National Hellenic Research Foundation, Athens 27th November **2013**; 6th Swedish-Hellenic Life Science Research Conference, Athens, 14-15 November **2013**; Workshop "Chemistry and Research Challenges", Athens, 23-24 April **2013**; 5th NHRF - Örebro University Life Science Research Conference, Athens, 11-12 October **2012**; Educational Event – SCIENCE in SOCIETY "The Role of Chemistry in the design and synthesis of potential drugs", Athens, 12 December **2011**; University of Basel, Department of Chemistry, 25 August **2011**; 43rd IUPAC World Chemistry Congress, San Juan, Puerto Rico, July 31 – August 5, **2011**; University of Athens, Department of Chemistry, 28 May **2010**; Budapest University of Technology and Economics, meeting of the COST ACTION CM0802 "PHOSCINET", 27 March **2010**; 10th Hellenic Symposium Catalysis, Metsovo, 3-4 October **2008**; 2nd Swedish–Hellenic Life Science Research Conference, Athens, 18-19 October **2007**; Heinrich-Heine-Universität Düsseldorf, Institut für Organische und Makromolekulare Chemie, 9 July **2007**; Max-Planck-Institut für Kohlenforschung (Seminars in Reetz's group), Mülheim an der Ruhr, 4 June **2007**; 2nd Hellenic Symposium "Green Chemistry and Sustainable Development", Patras, 8-10 March **2007**; National Hellenic Research Foundation, Athens 21st November **2006**; 9th Hellenic Symposium Catalysis, Leukada, 6-7 October **2006**; Universität Leipzig, Fakultät für Chemie und Mineralogie, Leipzig 5th April **2006**; Aristotle University of Thessaloniki, Department of Chemistry, 14th March **2006**; 8th FIGIPAS Meeting in Inorganic Chemistry, Athens, 6-9 July **2005**; 1st Hellenic Symposium Organic Synthesis. From Chemistry to Biology, Medicine and Materials Science, Athens, November 4-6, **2004**; Concordia University, Department of Chemistry and Biochemistry, Montréal 22nd July **2004**; Université de Montréal, Département de Chimie, Montréal 21st July **2004**; Leibniz-Institut für Organische Katalyse an der Universität Rostock e.V., Rostock 2nd June **2003**; XVth Fechem Conference on Organometallic Chemistry, Zürich, Switzerland, August 10 - 15, **2003**; University of Athens – Department of Chemistry, 14th April **2003**; 19th Hellenic Chemistry Conference, Heraklion-Crete November 6-10, **2002**; National Center for Scientific Research "Democritos", Institute of Physical

Chemistry, Athens 9th November **2001**; University of Crete – Department of Chemistry, Heraklion 16th October **2001**; Russian Academy of Sciences – Siberian Branch, Favorsky Irkutsk Institute of Chemistry, Irkutsk 26th June **2001**; 6th Chemistry Conference of Greece-Cyprus, Rhodes, September 2-5, **1999**; 1st International Conference of the Chemical Societies of the South-East European Countries on Chemical Sciences and Industry, Halkidiki, Greece, June 1-4, **1998**; 2nd Symposium of the Institute of Physical Chemistry “Chemical Research and Industry”, National Center for Scientific Research “Democritos”, Athens December 3-5, **1997**; National Hellenic Research Foundation, Athens 6th February **1997**; 17th Greek Chemistry Conference, Patras December 1-5, **1996**; Max-Planck-Institut für Kohlenforschung (Seminars in Reetz’s group), Mülheim an der Ruhr 30 October **1995**; Vrije Universiteit, Department of Chemistry, Amsterdam 26th January **1995**; University of Athens – Department of Chemistry, 21st October **1991**; Symposium of PhD students in Chemistry, National Center for Scientific Research “Democritos”, Institute of Physical Chemistry, Athens October 16-18, **1989**.

Funded Programs

Coordinator in EU programs: (1) TOK Marie Curie “SUPRAGENE” (2006 – 2010; budget: 331.4 K€ for our Institute); (2) EST Marie Curie “EURODESY” (2006-2010; budget: 984.1 K€ for our Institute; sub-coordinator since 2006 and coordinator after the initial coordinator “passed away”).

Coordinator in National programs: (1) “Contemporary Organic Chemistry and Applications” (1998; budget: 20.5 K€), training seminar for high school teachers; (2) Greece – Germany bilateral cooperation (2002-2004; budget: 15.4 K€); (3) a competitive GSRT project for the commercial exploitation of research results (2003-2005; budget: 44 K€); (4) Greece – Canada bilateral cooperation (2002-2005; budget: 59.9 K€).

Participation as scientist in charge in specific tasks in 2 European (FP7-REGPOT-2009-1 “ARCADE” 2010–2013, budget: 2.45 M€ for our Institute, and COST action CM0802 PhoSciNet 2009-2013, member of the Management Committee) and 11 National programs (with a total budget of ca. 3 M€).

At the present time, participation in two National programs (funding is expected in the next few months) with a total budget of ca. 1 M€ for our Institute.

Current Research Team

Yakinthi Batsi: PhD student

Rodolfos-Iosif Danalatos: undergraduate student

Katerina Nasaj: MSc student

Dr. Cecile Arbez-Gindre (Functional Scientist, permanent staff)

Dr. Georgia Antonopoulou (Scientific Technical Staff, permanent staff)

The size of the team is strongly dependent on the current external funding.

Other members of the Laboratory of Organic and Organometallic Chemistry: Dr. George Heropoulos (Researcher A), and 3 Researchers Emeriti (Dr. Constantinos Screttas, Dr. Barry Steele, Dr. Maria Micha-Screttas).

Team members (Former and/or current) directed by myself

(20) Katerina Nasaj: MSc student; (19) Rodolfos-Iosif Danalatos: undergraduate student, Internship (2017); (18) Marta Bartulewicz (Dublin Institute of Technology), Internship (Erasmus), 1.2.-31.7.2017; (17) Yakinthi Batsi: undergraduate student, Internship (2015), and MSc 2016-2017, PhD student 2017-present; (16) Anastasia Eftychidou (University of Aberdeen/Department of Chemistry), Internship, 2015; (15) Alia-Cristina Tenchiu (Deleanu): PhD student, 2006-2010 (PhD, 2012); post-doc, 2013-2015; (14) Iro Ventouri, undergraduate student, 2014; (13) Georgia Ntasi, undergraduate student, 2014; (12) Helene Kalismaki: undergraduate student, Internship, 2013; (11) Olga Ventouri: undergraduate student, Internship, 2013; (10) Polidoros-Chrisovalantis Ioannou (in collaboration with P. Kyritsis): MSc student, 2013 (MSc, 2014); (9) Anastasia Pournara (in collaboration with D. Kovala-Demertzi): PhD student, 2011-2013 (PhD, 2014); (8) Ioannis Stamatopoulos (in collaboration with P. Kyritsis): PhD student, 2011-2013 (PhD, 2014); (7) Maria Kapsi (in collaboration with P. Kyritsis): MSc student, 2011 (MSc, 2011); (6) Varvara Varda: 2010; (5) Christina Stangel (in collaboration with A. Coutsolelos): MSc student, 2009 (MSc, 2010); (4) Dr. Ioannis Liratzis: Post-doc, 2006-2008; (3) Dr. Evangelos Tolis: Post-doc, 2004-2005; (2) Dr. Fotini J. Andreadaki: Post-doc, 2003-2010; (1) Kalliopi A. Vallianatou: MSc and PhD student, 2002-2008, (MSc, 2004; PhD, 2008); "Leonidas Zervas" Prize in Organic Chemistry (5/3/2008); post-doc, 2010-2011;

Dr. Cecile Arbez-Gindre (Scientific Technical Staff, 2008-2016);

Dr. Georgia Antonopoulou (Scientific Technical Staff, 2009-present).

Former and/or current collaborations (outside NHRF)

National: Prof. Dr. A. Coutsolelos, University of Crete; Prof. Dr. G. Kokotos, University of Athens; Prof. Dr. D. Kovala-Demertzi, University of Ioannina; Ass. Prof. Dr. P. Kyritsis, University of Athens; Prof. Dr. D.D. Leonidas, University of Thessaly; Dr. A. Terzis, Dr. C. Raptopoulou, Dr. V. Psycharis, NCSR "Democritos".

International: Prof. Dr. S.V. Amosova, Favorsky Irkutsk Institute of Chemistry (Russia); Prof. Dr. A. Börner, Leibniz-Institut für Katalyse an der Universität Rostock (Germany); Prof. Dr. G.S. Hanan, Université de Montréal (Canada); Prof. Dr. E. Hey-Hawkins, University of Leipzig (Germany); Prof. Dr. L. Kollár, University of Pécs and Szentágothai Science Center (Hungary); Prof. Dr. E. Monflier, Université d'Artois, Lens (France);

Prof. Dr. A. Pfaltz, Universität Basel (Switzerland); Prof. Dr. M.T. Reetz/Director, Max-Planck-Institut für Kohlenforschung, Mülheim/Ruhr (Germany); Prof. Dr. J. Vohlídal, Charles University, Prague (Czech Republic).

Further Information

Development of research programs in the field of transition metal homogeneous catalysis at the National Hellenic Research Foundation.

Member of the organizing committee and/or chair in conferences, workshops, educational events, e.g. XXth International Conference on Organometallic Chemistry (2002), 11th Hellenic Symposium in Catalysis (2010), 5th NHRF – Örebro University Life Science Research Conference (2012), workshop “Supragene” (2008), Workshop “Asymmetric Synthesis and Non-Conventional Advanced Synthetic Techniques for Fine Chemicals and Pharmaceuticals” (2010), educational event for the general public “Green Chemistry” (2014); Targeted Drug Discovery Workshop (2016).

Member of committees for MSc and PhD Theses.

Member and Rapporteur in committees for recruitment and promotion of researchers.

Member of the Internal Scientific Council of the IOPC & IBMCB/NHRF.

Service to third parties.

Exhibit of research presented at the Thessaloniki International Fair (Sept. 2014 & 2015).

Military service: Special Forces, 1991-1993 (trainer in marines).

Sports: Taekwon Do (black belt, 4th DAN).

Marital status: Married, 2 children

Place – Year of Birth: Karystos (Evia, Greece) – 1964.

Recent Research Activities

A non-updated website for our group (Organic and Organometallic Chemistry):

<http://www.eie.gr/nhrf/institutes/iopc/researchgroups/ooc-group/ooc-group-en.html>

1. TRANSITION-METAL HOMOGENEOUS CATALYSIS

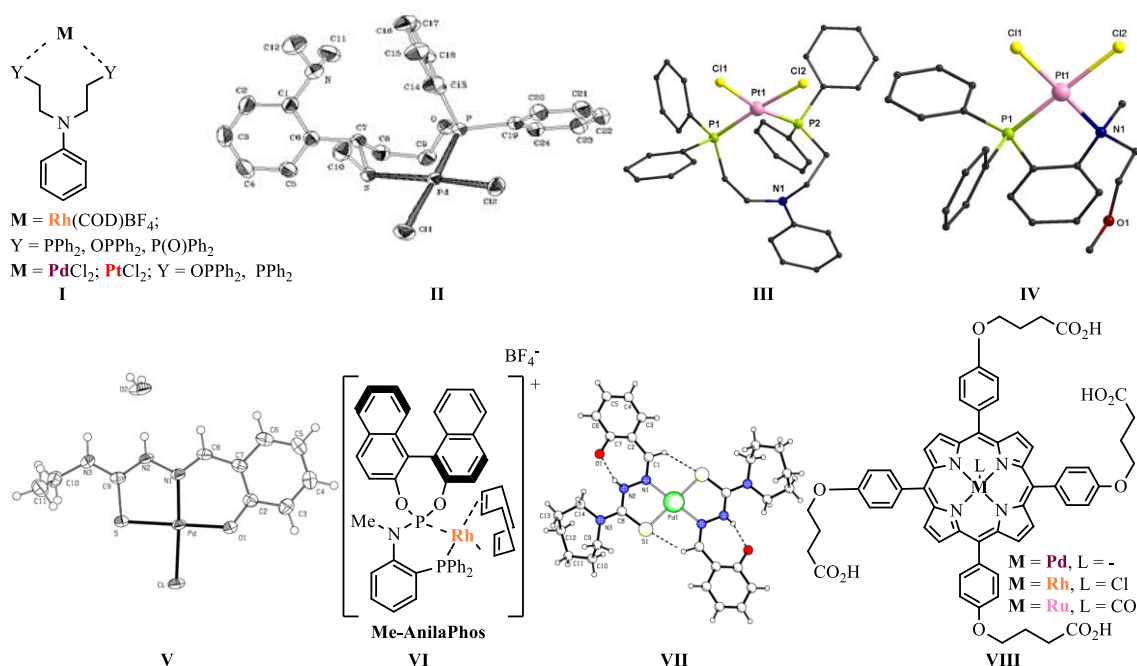
Our investigations include the development of transition-metal (e.g. Ru, Rh, Pd, Pt) complexes with novel ligands and their evaluation as catalysts in reactions of enormous academic and industrial interest, such as hydroformylation, hydrogenation, coupling reactions (Heck, Suzuki). More specifically, our research activities include:

(a) *Catalysis by hybrid and hemilabile phosphorus ligands* (e.g. phosphines, phosphine oxides, phosphinites, mixed phosphine-phosphinites) possessing additional potent donors such as oxygen, nitrogen, sulfur (e.g. I – IV).

(b) *Catalysis in air by phosphane-free ligands* such as thiosemicarbazones (e.g. V, VII) and chalcogen-containing Schiff bases. We are pioneers on the use of

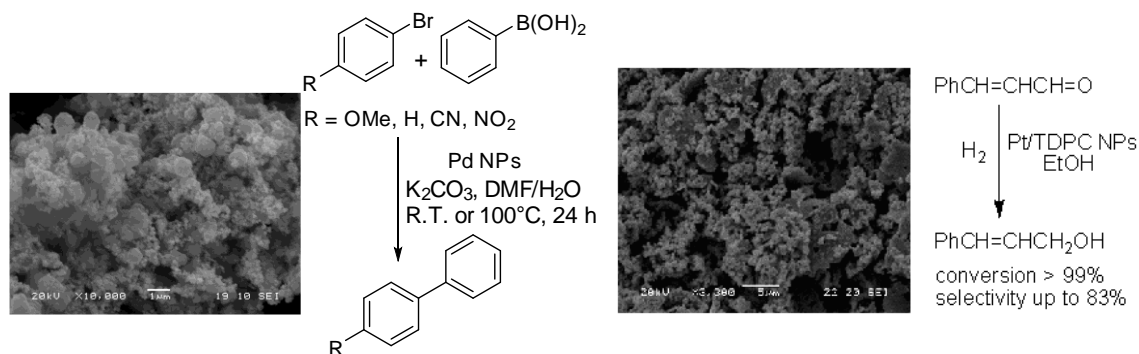
thiosemicarbazones as catalyst precursors for palladium-catalyzed coupling reactions (Heck, Suzuki), under aerobic conditions, and one of our Pd complexes is commercially available by SIGMA-ALDRICH (Product No.: 674125) and other companies.

- (c) *Asymmetric catalysis* with new chiral amino diphosphite, phosphonite, phosphite-phosphoramidite and phosphine-phosphoramidite ligands, such as **Me-AnilaPhos** (VI) as a highly efficient ligand for the rhodium-catalyzed enantioselective olefin hydrogenation (100% conversion after 10 min at r.t. and 1 bar pressure, 98% ee).
- (d) *Catalysis by high energy techniques* such as a microwave irradiation. This technique was used to the Suzuki coupling in air, catalyzed by a palladium complex with a thiosemicarbazone ligand (VII), totally inactive under conventional heating.
- (e) *Aqueous catalysis* offering environmental benefits and also the advantage of the recycling and reusing the catalyst. We have published the first study concerning the evaluation of air-stable and water-soluble metalloporphyrins (VIII) in the Suzuki reaction and also the selective hydrogenation of unsaturated aldehydes in neat water or in aqueous/organic biphasic system, respectively. The catalysts could be easily recycled and reused.



2. CATALYSIS BY METAL NANOPARTICLES

We have synthesized metal nanoparticles (NPs) such as thiosemicarbazone-stabilised Pd NPs and Pt NPs using 3,3'-thiodipropionic acid as a protective agent as efficient catalysts for the Suzuki reaction and the selective hydrogenation of *trans*-cinnamaldehyde, respectively. The nanocatalysts could be recovered and reused.

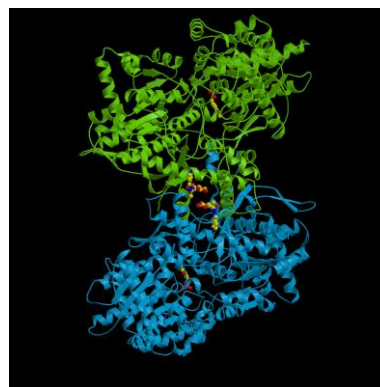
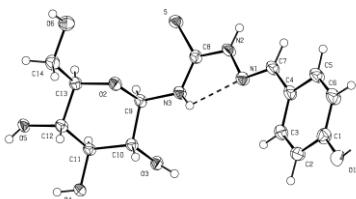
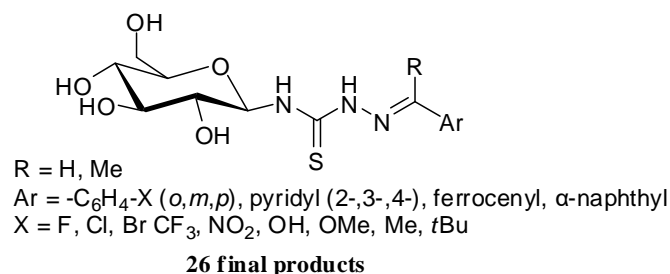


3. DENDRIMER CHEMISTRY

The project focuses on the development of novel cyclodextrin end-functionalized triazine dendrimers as potent bioactive molecules.

4. MEDICINAL CHEMISTRY

The project includes the synthesis of bioactive organic and organometallic compounds and investigation of their bioactivity. For instance, we synthesized a series of β -D-glucopyranosyl-modified thiosemicarbazones, which found to be inhibitors of glycogen phosphorylase, a target for the design of type 2 diabetes therapeutics. Recently, we have developed a large number of substituted thiazole derivatives as potent inhibitors of BRAF^{V600E} (anticancer reagents).



Crystal structure of GP - glucose-thiosemicarbazone complex
15 crystal structures
 $\text{IC}_{50} \sim 5 \text{ mM (minimum)}$

PUBLICATIONS (as corresponding or sole author in their high majority)

Book Chapters

- I.D. Kostas*** "Recent Advances in P,N-Containing Ligands for Transition-Metal Homogeneous Catalysis". In *Advances in Organic Synthesis*, Atta-ur-Rahman, FRS

- (Ed.), Bentham Science, **2013**, Vol. 6, pp. 3-58. **Invited book chapter.**
<http://www.benthamscience.com/ebooks/9781608050291/>
3. **I.D. Kostas*** "Other P/N-Ligands". In *Phosphorus Ligands in Asymmetric Catalysis – Synthesis and Applications*, A. Börner (Ed.), Wiley-VCH, Weinheim, **2008**, vol. 2, part IV, chapter 1.2, pp. 596-632. **Invited book chapter.**
<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-3527317465.html>
 2. BC N.G. Oikonomakos*, M.N. Kosmopoulou, D.D. Leonidas, E.D. Chrysinia, C. Tiraidis, N. Bischler, K.E. Tsitsanou, S.E. Zographos, **I.D. Kostas**, G. Eisenbrand "Indirubin and indigo analogues as potential inhibitors of glycogenolysis: structural basis of glycogen phosphorylase inhibition". In *Indirubin, the red shape of indigo*, L. Meijer, N. Guyard, L.A. Skaltsounis, G. Eisenbrand (eds.). Editions "Life in Progress", Roscoff, **2006**, Chapter 18, 177-189.
 1. **I.D. Kostas*** "Applied Homogeneous Catalysis". In *Contemporary Organic Chemistry and Applications* (in Greek), National Hellenic Research Foundation, Institute of Organic and Pharmaceutical Chemistry, Athens **1998**, pp. 27-48.

Guest Editor of Special Issues

1. *CATALYSTS* (Academic Editor: Ioannis D. Kostas), Special Issue "Suzuki–Miyaura Cross-Coupling Reaction and Potential Applications". Papers were published during **2016-2017**.

Publications in refereed journals

43. **I.D. Kostas***, G. Antonopoulou, C. Potamitis, C.P. Raptopoulou, V. Psycharis *J. Organomet. Chem.* **2017**, *828*, 133-141 "Platinum Complexes with a methoxy-amino phosphine or a nitrogen-containing bis(phosphine) ligand. Synthesis, characterization and application to hydrogenation of *trans*-cinnamaldehyde"
<http://www.sciencedirect.com/science/article/pii/S0022328X16305496>
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Announcements in Conferences

Total number of abstracts: 81; in International and European Conferences: 48; in National Conferences: 33. Plenary lectures: 4; Oral presentations: 25; Posters: 52.