Curriculum Vitae

Theofanis N. Kitsopoulos

Status Professor of Chemistry, University of Crete, Affiliated Researcher at the Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology-Hellas (FORTH), Adjunct Professor of Physical Chemistry at the Institute of Physical Chemistry at the University and the Max Planck Institute for Multidisciplinary Sciences, in Göttingen Germany.

Personal

Marital Status: Married, Two Daughters
Languages: English (excellent), Greek (excellent), German (fair)

Academic Degrees

B. Sc. in Chemistry (with highest honors), University of Illinois, Chicago, 1986

Ph. D. in Physical Chemistry, University of California, Berkeley, 1991.
Research Supervisor: Prof. Daniel M. Neumark, ***Thesis Ttile:*** Threshold Photodetachment Spectroscopy of Negative Ions

Postoctoral Experience

Sandia National Laboratories, Livermore, USA, 1991-93.
Research Advisor: Dr. David Chandler

Academic Awards

- Humboldt Foundation Research Award 2012
- Friedrich von Bessel Award, Humboldt Foundation 2004
- Bodossaki Science Award in Chemistry 2003
- University of California Regents Fellow, Berkeley 1988-89
- IBM Predoctoral Fellow, Berkeley 1987-88
- Phi Beta Kappa, 1986
- B.J. Freud Award, Outstanding Junior in Chemistry, University of Illinois 1985

Research Awards

ERC advanced grant 2019-2024 (2.5M€)

Military Service

Greek Infantry Division 1993-94

Employment

1994-1999	Assistant Professor University of Crete and Research associate IESL-FORTH
1999-2007	Associate Professor University of Crete and Research associate IESL-FORTH
2007-	Professor University of Crete and Research associate IESL-FORTH
2012-	Adj. Professor University and Max Planck Institute of Biophysical Chemistry Göttingen

2006-2008	Chairman Department of Chemistry, University of Crete
2006-2010	Vice Rector University of Crete, Infrastructures and Student Affairs
2009-2010	President of University Technical Council
2008-2011	Vice-President of the University Research Council
2005-2014	Member of The Scientific Council IESL-FORTH

Research Interests

Current Research at the University of Göttingen and the Max Planck Institute for Biophysical Chemistry involves construction of two new molecular beam scattering apparatuses. The first machine is a next generation imaging spectrometer, that includes a hot pulsed nozzle (up to 1500K) and the second a crossed molecular beam scattering machine to study chemical reactivity and dynamics on surfaces under extreme conditions. The crossed beam machine, demonstrates the ability of using imaging of scattered reaction products for measuring velocity selected kinetics. This is a major breakthrough in surface science as it allows for facile measurements of absolute rate constants for reactions relevant to heterogeneous catalytic processes. Both machines have been completed and are producing publications ***Nature* (2018)** ***Nature Reviews Chemistry* (2019),** ***Science (2020)***.

My group's earlier research interests were related to ***chemical dynamics***. Specifically my experiments aim towards the determination of the state-to-state differential cross sections for a chemical process be it a full or half collision. Our main experimental methodology involves velocity mapping or ion imaging. We made a major improvement in traditional photofragment imaging that we call ***slice imaging*** that improves the sensitivity to spatial anisotropy parameters such that we are able to measure the photofragment alignment and orientation from single ion images, that offers additional detail information on the structure and dynamics of multiple / interfering excited electronic states. In a second series of experiments we have been investigating the reactivity of photolytically produced species (hot atoms or radicals). There are two types of experimental approaches. The first is photoloc product imaging, where precursor reagents are premixed and co-expanded. The hot atom or radical is produced photolytically and products are rovibrationally state selected using resonant enhanced multiphoton ionization (REMPI). The speed distribution is measured using velocity mapping and analysis using either direct or Fourier basis set analysis yield the state resolved differential cross section (SRDCS). The reactions of Cl+ethane and Cl + Butane reaction have been studied using this technique. More recently a major breakthrough has been achieved where we have been able to measure SRDCS using a crossed molecular beam setup and (2+1) REMPI detection of products. This novel approach lends itself to a plethora of polyatomic chemical reactions to be studied with rotational resolution.

Low Energy Photoelectron Imaging Spectroscopy (LEPIS) as a new way to probe the electronic properties of self-assembled monolayers, close to the Fermi level. This method relies on imaging of photoelectrons produced by the metal substrates after UV irradiation. Following the ejection of the electrons from the substrate they are transmitted through the organic monolayer. We showed that this method allows relative work function measurements of the monolayer coated substrate, as well as the study of the kinetics of the formation of the monolayer of the alkanethiol from solution. Currently we wish to extend this method using a transient absorption analogue. The electron transmission of our light harvesting molecules and the antenna molecular assemblies will be studied in the LEPIS arrangement. A pump photon will be used to excite the light-harvesting molecule and the second UV photon will be used to create photoelectrons from a Gold substrate. The transmission of these photoelectrons through he molecular assembly will be measured as a function of pump pulse energy, and delay. Two sets of experiments are performed: (a) Using ns laser systems we will explore the overall transmission characteristics of the molecular assemblies (organization, concentration, chemistry and structures) and (b) once we have narrowed down the "most promising" candidates, we will repeat the experiment using fs laser pulses in order to understand the detail dynamics of the electron transfer/charge separation process. Using two dimensional (2D) position sensitive detection (imaging) for electron detection, our setup allows for spatial information to be extracted, thus observing to only the total "current" but also the topography of the current produced. Control of the directionality of the electron current remains a challenge as does understanding the underlying physics of this process.

The aforementioned breakthrough methods have recently been extended to (ii) Dye Sensitized Photovoltaics, and (iii) more lately, in Medical Spectroscopy / Ophthalmology, where he pioneered laser-based methods to the cross linking treatment of keratoconus.

Teaching

1. General Chemistry (mandatory course).
2. General Physics (for chemistry majors) (mandatory course).
3. Physical Chemistry (mandatory course).
4. Physical Chemistry Laboratory (mandatory course).
5. Chemical Kinetics and Dynamics (elective for seniors and graduate students).
6. Building a Scientific Apparatus (elective for seniors and graduate students).
7. Laser Applications in Chemistry (elective for seniors and graduate students).
8. Laser Spectroscopy (elective graduate course).
9. Quantum Chemistry (elective for seniors and graduate students).

Chapters in Books

1. D.W.Chandler, T.N. Kitsopoulos, A.J.R. Heck, R.I. McKay, M.A. Buntine, D.P. Baldwin, R.N. Zare, **Reaction Product Imaging: The H + HI Reaction**, *Gas-Phase Chemical Reaction Systems: Experiments and Models 100 Years after Max Bodenstein*, (eds. J. Wolfrum, H.-R. Volpp, R. Rannacher, J. Warnatz) Springer Series in Chem. Phys. (Springer Berlin, Heidelberg 1996).
2. P.C. Samartzis PC, D.J. Smith and T.N. Kitsopoulos, **Velocity Map Imaging of Reaction Products: The Cl+C2H6 -> HCl+C2H5 reaction,** Imaging in Chemical Dynamics, Edited by A.G. Suits and R.E, Co ntinetti, ACS symposium series 770 (Oxford Press 2000)
3. T.P. Rakitzis and T.N. Kitsopoulos, **Measurement of state-resolved differential cross-sections of bimolecular reactions using single beam velocity mapping**, Chapt. 10 Imaging in Molecular Dynamics, Edited by B.J. Whitaker (Cambridge University Press 2003).
4. T.P. Rakitzis and T.N. Kitsopoulos, **Slice Imaging: a new approach to ion imaging and velocity mapping**, Chapt. 11, Imaging in Molecular Dynamics, Edited by B.J. Whitaker (Cambridge University Press 2003).

Undergraduate Diploma Theses

1. Peter Samartzis (Chemistry)
2. Ioannis Sakellariou (Physics)
3. Margellou Asimina (Chemistry)
4. Dakanali Eva (Chemistry)
5. Papadopoulos George (Chemistry)
6. Tsiggaridas Lambros(Chemistry)
7. Dimitris Zaouris (Chemistry)
8. Niki Diamantopoulou (Chemistry)
9. Beate Kempke (Chemistry Göttingen)
10. Jan Fingerhut (Chemistry Göttingen, ongoing)

Masters

1. Tsiggaridas Lambros(2001 Chemistry)
2. Giannis Sakellariou (2008 Chemistry)
3. Dimitris Zaouris (2010 Chemistry)
4. Niki Diamantopoulou (2010 Chemistry)
5. Dima Borodin (2017 Chemistry, Göttingen)
6. Michael Schwarzer (2019 Chemistry, Göttingen)

PhD's

1. Dr. Peter Samartzis (Chemistry)
2. Fragkouli Despina (Chemistry)
3. Karaiskou Anna (Chemistry) (Principal Supervisor Prof. Rakitzis Physics)
4. Mirela Suchea (Chemistry) (Principal Supervisor Prof. Kiriakidis Physics)
5. Fengyan Wang (Dalian University PRC)
6. Andreas Kartakoulis (Chemistry)
7. Pavle Glodic (Chemistry)
8. J. Neugebohren (Chemistry Göttingen)
9. Dima Borodin (Chemistry Göttingen)
10. Michael Schwarzer (Chemistry Göttingen, ongoing)
11. Loic Lecroart (Chemistry Göttingen, ongoing)
12. Hinrich Hahn (Chemistry Göttingen, ongoing)

Post-Doctorals

1. Dr. Theodosia Gougousi (USA/GR) 1996-97
2. Dr. Derek Smith (UK) 1999-2000
3. Dr. Christoph Gebhardt (DE) 2000-2001
4. Dr. Peter Rakitzis (USA/GR) 1999-2000
5. Dr. Rachel Toomes (UK) 2002-2004
6. Dr. Alrik van den Brom (NL) 2003-2005
7. Dr. Luis Rubio Lago (SP) 2004-2006
8. Dr. Laura Lipciuc (RO) 2006-2007
9. Dr. D. Harding (UK) 2012-2017 (Göttingen with Prof. Wodtke)
10. Dr. Georgios Skoulatakis 2019- (Göttingen)
11. Dr. Jan Gewecke 2019- (Göttingen)

Visitors Laser Facility Users

1. Prof. David Parker, Dr. B. Bakker, Dr. A.T.J.B. Eppink, M. Coriou, D. Chestakov, M. Wu (University of Nijmegen, NL)
2. Prof. Mike Ashfold, Dr. H. Nahler, Dr. M. Beckert (University of Bristol, UK)
3. Prof. A. Orr-Ewing, Dr. C. Murray, Dr. S. Rudic (University of Bristol, UK)
4. Dr. C. Vallence, Dr. M. Bass (University of Oxford)
5. Prof. Bruno Martinez Haya (University of Seville, SP)
6. Dr. P. Quintana (University of Madird, SP)
7. Prof. Moshe Shapiro (Weizmann, IL)
8. Prof. Ron Naaman, Dr. D. Dimitrov, Dr. S. Trakhtenberg (Weizmann, IL)
9. Dr. Sun Zheng (TU Munich, DE)
10. Prof. R. Metz (University of Massachusetts, USA)
11. Dr. C. Bucher (MPQ, DE)
12. Dr. A. Alexander, (University of Edinburough)
13. Prof. Luis Banares (Compultense University, SP)
14. Prof. Mauricio Beccuci (Univ. of Florence)
15. Dr. Michal Farnik, (Heyrovsky Institute Prague)
16. Prof. B.J. Whitaker (Leeds University)

International Meeting Organization

1. Workshop On Imaging Techniques in Chemical Dynamics (Fodele 2000)
2. XXI International Symposium on Molecular Beams (Hersonnisos May 2005)

Research Funding

i. RTN, HUMAN POTENTIAL-Marie Curie, IMAGINE (200.000. €) 1997-2001
ii. RTN, HUMAN POTENTIAL-Marie Curie, REACTIVES (170.000 €) 2000-2004
iii. GROWTH, SENTIMATS (360.000 €) 2001-2004
iv. RTN, HUMAN POTENTIAL-Marie Curie, PICNIC (150.000 €) 2002-2005
v. PYTHAGORAS, (70.000 €) 2004-2007
vi. TOK, HUMAN POTENTIAL, 2005-2009, SOUTHERN DYNAMICS (356.000 €)
vii. ITN, HUMAN POTENTIAL, FP7 2009-2013, ICONIC (480.000€)
viii. Industry Academia Coop, ESPA 2013-2015, CLEAR (500.000€)
ix. ΕΠΕΑΕΚ, Applied Molecular Spectroscopy (1.500.000 €) 1998-2003
x. Thalis, Laser Mater Interactions ESPA 2012-2015 (600.000 €)
xi. Kinetics and Dynamics on Surfaces, ERC EU, 2019-2024 (2.5000.000 €).