2015

# Environment Abstracts

## Tenth Annual International Symposium on Environment 25-28 May 2015, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

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# TABLE OF CONTENTS

*(In Alphabetical Order by Author's Family name)*

# Preface

This abstract book includes all the abstracts of the papers presented at the 10th Annual International Symposium on Environment, 25-28 May 2015, organized by the Athens Institute for Education and Research. In total there were 34 papers and 37 presenters, coming from 19 different countries (Albania, Algeria, Australia, Bulgaria, Canada, Chile, China, France, India, Indonesia, Iran, Jordan, Kuwait, Poland, Saudi Arabia, Thailand, Turkey, UK and USA). The conference was organized into eight sessions that included areas of Biomass and Residues Utilization, Green Engineering, Air and Water Pollution, Energy & Fuel and other related fields. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books and/or journal of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into four research divisions and nineteen research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

**Gregory T. Papanikos**
**President**

**FINAL CONFERENCE PROGRAM**
**10th Annual International Symposium on Environment, 25-28 May, 2015, Athens, Greece**

## PROGRAM

**Conference Venue**: **Titania Hotel, 52 Panepistimiou Avenue, Athens, Greece**

## Organization and Scientific Committee

1. Dr. Gregory T. Papanikos, President, ATINER.
2. Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
3. Dr. Nicolas Abatzoglou, Head, Environment Research Unit, ATINER & Professor, Department of Chemical & Biotechnological Engineering, Université de Sherbrooke, Canada, Chair Pfizer, PAT in Pharmaceutical Engineering, Director GREEN-TPV and GRTP-C & P.
4. Ms. Olga Gkounta, Researcher, ATINER.
5. Dr. Zagabathuni Venkata Panchakshari Murthy, Professor/Head, Department of Chemical Engineering, S.V. National Institute of Technology, India.
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9. Dr. Devasena M. Sridhar, Assistant Professor, Sri Krishna College of Technology, India.
10. Dr. Arzu Yakar, Assistant Professor, Afyon Kocatepe University, Turkey.
11. Dr. Amin Talei, Lecturer, School of Engineering, Monash University, Malaysia.
12. Dr. Amitava Rakshit, Faculty Member, Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Sciences, Banaras Hindu University, India.
13. Dr. Hussein Gamal El Dien Amin Karaman, Researcher, Drainage Research Institute, Egypt.
14. Dr. Jeyakanthan Sivalingam, Scientist, Deltaic Regional Centre, National Institute of Hydrology, Andhra Pradesh, India.
15. Mr. Hossein Tabari, Research Assistant, Hydraulics Division, Department of Civil Engineering, Catholic University of Leuven, Belgium.
16. Dr. Mordechai Shechter, Emeritus Professor, Department of Economics and Department of Natural Resource & Environmental Management, University of Haifa, Israel.
17. Dr. Braulio Jimenez-Velez, Professor, Department of Biochemistry, School of Medicine, University of Puerto Rico, Puerto Rico.

18. Dr. Ibrahim A. Hassan, Professor of Environmental Biology, Faculty of Science, Alexandria University, Egypt & Centre of Excellence in Environmental Studies, King Abdulaziz University, Saudi Arabia.
19. Dr. Bronwyn Isaac, Assistant Lecturer, School of Biological Sciences, Monash University, Australia.
20. Dr. Nirit Bernstein, Academic Member, ATINER & Senior Research Scientist, The Volcani Center, Institute of Soil, Water, and Environmental Sciences, Israel.
21. Dr. Cinzia Gravili, Researcher-Technician, Laboratory of Zoology and Marine Biology, University of Salento, Italy.

**Administration**

Stavroula Kyritsi, Konstantinos Manolidis, Katerina Maraki & Kostas Spiropoulos

# Monday 25 May 2015

(all sessions include 10 minutes break)

## 08:00-09:00 Registration and Refreshments

## 09:00-09:30 (ROOM F) Welcome & Opening Remarks

- Dr. Gregory T. Papanikos, President, ATINER & Honorary Professor, University of Stirling, UK.
- Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
- Dr. Nicolas Abatzoglou, Head, Environment Research Unit, ATINER & Professor, Department of Chemical & Biotechnological Engineering, Université de Sherbrooke, Canada, Chair Pfizer, PAT in Pharmaceutical Engineering, Director GREEN-TPV and GRTP-C & P.

## 09:30-11:00 Session I (ROOM G): Biomass Utilization and Green Engineering

**Chair:** Olga Gkounta, Researcher, ATINER.

1. Nicolas Abatzoglou, Head, Environment Research Unit, ATINER & Professor, Department of Chemical & Biotechnological Engineering, Université de Sherbrooke, Canada, Chair Pfizer, PAT in Pharmaceutical Engineering, Director GREEN-TPV and GRTP-C & P & Jorin-Nicholas Mamen, Executive Director & Network Manager, BioFuelNet Canada. Biorefineries and the Canadian BioFuelNetwork: Phase II.
2. Jean Paris, Professor, Polytechnique Montreal, Canada, Mariya Marinova, Researcher, Polytechnique Montreal, Canada & Michel Perrier, Professor, Polytechnique Montreal, Canada. Forest Biomass and Paper Industry, a Pathway to Green Biofuels.
3. Ying Wang, Professor, Nanjing University, China, Fei Kong, MSc Student, Nanjing University, China, Yong Guo, Professor, Nanjing University, China, Cheng Hai Ma, Ph.D. Student, Nanjing University, China, Jun Zhou, Ph.D. Student, Nanjing University, China & Zhi Gang Zhou, Professor, Nanjing University, China. Developing Efficient Polymeric Photocatalysts by Coupling Benzoic Acid Derivatives on Carbon Nitride Polymer.
4. *Marjorie Valix, Lecturer, The University of Sydney, Australia, Daniel Stoddart &

Young Hong, The University of Sydney, Australia. Effect of Epoxy Depolymerisation in the Leaching of Copper from Electronic Waste.

**11:00-12:30 Session II (ROOM G): Biological Impact**

**Chair:** *Marjorie Valix, Lecturer, The University of Sydney, Australia

1. Andrzej Kornas, Professor, Pedagogical University, Poland, Zbigniew Miszalski, Professor, Jagiellonian University, Poland & Maciej Kocurek, Ph.D., Jan Kochanowski University, Poland. Photosynthetic Activity of Stems in Two *Clusia* Species.
2. Jian Hua Zhu, Professor, Nanjing University, China, Wei Gang Lin, Ph.D. Student, Nanjing University, China, Xiao Dan Sun, MSc Student, Nanjing University, China & Ying Wang, Professor, Nanjing University, China. Capturing the Tobacco-specific Nitrosamines (TSNA) in Environment.
3. Nathalie Clement, Ph.D. Student, IFSTTAR, France, Bogdan Muresan, Researcher, IFSTTAR, France & Denis Francois, Researcher, IFSTTAR, France. Bioindication of PAHs and Palladium Pollution from Road Traffic.
4. Ana Kalemaj, Secretary, Faculty of Natural Scinces, Tirana University, Albania & Mirela Lika, Professor, Tirana University, Albania. Food Allergy in the Students of Tirana City Ranging from Age 6 to 10.
5. Li Mo, Master Student, Beijing Forest University, China. Deposition of Size-fractionated Particulate Matter in Cuticle of Urban Plants.

**12:30-13:30 Lunch**

**13:30-15:00 Session III (ROOM G): Solid Waste and Residues Utilization**

**Chair**: *Khaled Abdullah Al-Hajery, Director, Environmental Protection and Control Department, Royal Commission for Juball and Yanbu, Saudi Arabia.

1. Thirawudh Pongprayoon, Associate Professor, King Mongkut's University of Technology North Bangkok, Thailand. Oil Removal from Contaminated Soil by Surfactant.
2. Damien Evrard, Ph.D. Student, Mines Saint-Etienne, France, Valerie Laforest, Professor, Mines Saint-Etienne, France, Jonathan Villot, Lecturer, Mines Saint-Etienne, France, Rodolphe Gaucher, Head, Unit "Clean Technologies" INERIS, France, Natacha Darmon, Head, Group Regulation & Installations, EDF-CIDEN, France & Sofia Bouhrizi, Engineer, EDF-CIDEN, France. Identification of Representative Installations to Determine Best Available Techniques: A Methodological Proposal.
3. Young Hong, Ph.D. Candidate, University of Sydney, Australia & Marjorie Valix, University of Sydney, Australia. Transforming the Recycling of E-Wastes with Thiosulfate.

**15:00-16:30 Session IV (ROOM G): Laws, Management and Planning**

**Chair**: *Tayel El-Hasan, Professor, Mutah University, Jordan.

1. *Khaled Abdullah Al-Hajery, Director, Environmental Protection and Control Department, Royal Commission for Juball and Yanbu, Saudi Arabia. How Did the Royal Commission Reduce Its Environmental Foot Print.
2. Carolus Prasetyadi, Lecturer, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Indonesia & Adi Sulaksono, Graduate Student, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Indonesia. Jogja National Geopark and its Brilliant Policy.
3. Nikolaos Voulvoulis, Reader in Environmental Technology, Imperial College

London, U.K. Pharmaceuticals in the Aquatic Environment: The Need for Catchment Management.

4. A. Rivard, Graduate Student, Texas A&M University at Galveston, USA, J. Mileski, Department Head, Maritime Administration, Texas A&M University at Galveston, USA & M. von Zharen, Regents Professor, Department of Marine Science, Texas A&M University at Galveston, USA. All Aboard: The Wicked Problem of Marine Spatial Planning.

**21:00-23:00 Greek Night and Dinner (Details during registration)**

# Tuesday 26 May 2015

**08:00-10:00 Session V (ROOM G): Energy & Fuel**

**Chair:** *Saif Uddin, Research Scientist, Kuwait Institute for Scientific Research, Kuwait

1. *Sonia Damyanova, Professor, Institute of Catalysis, Bulgarian Academy of Sciences, Bulgaria, Adriano Braga, Federal University of Sao Carlos, Brazil, Joao dos Santos, Federal University of Sao Carlos, Brazil & Jose Maria Buenno, Federal University of Sao Carlos, Brazil. Hydrogen Production by Ethanol Steam Reforming.
2. Marek Stelmachowski, Professor, Lodz University of Technology, Poland. Photocatalytic Production of Hydrogen from Water Solution of Glycerol over the Tio2 Doped by Noble Metals.
3. *Tayel El-Hasan, Professor, Mutah University, Jordan. The Environmental Consequences of the Oil Shale Utilization in Jordan: The Effect of Combustion Processes.
4. Radostina Palcheva, Assistant Professor, Institute of Catalysis, Bulgarian Academy of Sciences, Bulgaria, Barbara Pawelec, Institute of Catalysis and Petrochemistry, Spain, Eric Gaigneaux, Universite Catholique de Louvain, Belgium, Jose Luis Fierro, Institute of Catalysis and Petrochemistry, Spain & Sonia Damyanova, Professor, Institute of Catalysis, Bulgarian Academy of Sciences, Bulgaria. Hydrogen Production from Renewable Resources.
5. Rallou Dadioti, PhD Researcher, De Montfort University, U.K. & Simon Rees, Reader in Architectural Engineering and Renewable Systems, De Montfort University, U.K. Wind Power Resource Assessment in Urban Environment Based on Computational Fluid Dynamics Modeling.

**10:00-11:30 Session VI (ROOM G): Air Pollution**

**Chair:** *Ali Ariapour, Academic Member, Boroujerd Branch, Islamic Azad University, Iran

1. Fernando Valenzuela, Head, Unit Operation and Hydrometallurgy Laboratory, Universidad de Chile, Chile. Use of Modified Nano-Structured Silicates for Treatment of Highly Polluted Acidic Mine Drainages.
2. Raul G.E. Morales, Chairman, Centre for Environmental Sciences, University of Chile, Chile, Richard Toro & Manuel A. Leiva. Critical Episode Patterns of Atmospheric Pollution by Particulate Matter at Santiago City, Chile.
3. *Krassi Rumchev, Discipline Leader, Curtin University, Australia, D. Bertolatti, Curtin University, Australia, B. Mullins, Curtin University, Australia & I. Chakma, Curtin University, Australia. Concentrations and Elemental Compositions of Airborne Particulate Matter in Perth Metropolitan Area, Australia.
4. Praveen Babu, Ph.D. Student, Indian Institute of Technology Delhi, India, Mukesh Khare, Professor, Indian Institute of Technology Delhi, India & Radha Goyal, Post-Doctoral Fellow, Indian Institute of Technology Delhi, India. Chemical Characterization of Airborne Particles Collected in an Underground Metro Station

Platform in Delhi City.
5. Zeyu Ma, MSc Student, Beijing Forestry University, China. The Distribution of Concentration of PM2.5 in Different Regions of Beijing in Summer and Autumn.

**11:30-13:00 Session VII (ROOM G): Water Pollution**

**Chair:** *Sofia Djerdali, Professor, University Ferhat Abbes, Algeria

1. Kamchai Nuithitikul, Associate Professor, Walailak University, Thailand, Sarawut Srikun, Postgraduate Student, King Mongkut's University of Technology North Bangkok, Thailand & Samorn Hirunpraditkoon, Associate Professor, Naresuan University, Thailand. Synthesis of Activated Carbons from Durian Peel and Their Adsorption Performance for Lead Ions in Aqueous Solutions.
2. Amita Chaudhary, Ph.D. Scholar, Govt. Technical Institute, India & Ashok N. Bhaskarwar, Professor, Govt. Technical Institute, India. A Novel Ionic Liquid for Carbon Capture.
3. Deniz Dolgen, Instructor and Professor, Dokuz Eylul University, Turkey & Mehmet Necdet Alpaslan, Professor, Dokuz Eylul University, Turkey. Greenhouse Gas Emissions (GHGs) Related to the Wastewater Treatment Plants.
4. Aicha Sebti, Ph.D. Student and Researcher, Unité de Développement des Equipements Solaires, EPST CDER, Algeria, Boutra Belgacem, Lebik Hafida, Medjene Farid, Igoud Sadek & Aoudjit Lamine. Renewable Energy Development Center, Algeria. Numerical Simulation of Solar Reactor for Water Disinfection.

**13:00-14:30 Session VIII (ROOM G): Environmental Impact & Other Essays**

**Chair:** Nicolas Abatzoglou, Head, Environment Research Unit, ATINER & Professor, Department of Chemical & Biotechnological Engineering, Université de Sherbrooke, Canada, Chair Pfizer, PAT in Pharmaceutical Engineering, Director GREEN-TPV and GRTP-C & P.

1. Bhaskar Kura, Professor, University of New Orleans, USA. Promoting Sustainability at the World Ports: Research Efforts at the University of New Orleans.
2. *Sofia Djerdali, Professor, University Ferhat Abbes, Algeria & Francisco Sanchez Tortosa, Professor, University of Cordoba, Spain. Anthropogenic Food Subsides Enhance Egg Volume and Hatching Mass in White Stork *Ciconia Ciconia* in Setif Area (Northern ALGERIA).
3. *Ali Ariapour, Academic Member, Boroujerd Branch, Islamic Azad University, Iran, Elahe Karami, M.Sc. Graduate, Boroujerd Branch, Islamic Azad University, Iran, Amir Heidari Jamshidi, Senior Expert, Jihade Agriculture Organization of Lorestan Province, Iran & Fatemeh Jaidari, Boroujerd Branch, Islamic Azad University, Iran. Application of Geographic Information System (GIS) in Soil Erosion Modeling by MPSIAC Method in Boroujerd Rangeland, Sarab Sefid, Iran.
4. *Saif Uddin, Research Scientist, Kuwait Institute for Scientific Research, Kuwait. Radioactivity in Seawater – A Review from Northern Persian Gulf.

**14:30-15:30 Lunch**

**15:30-18:00 Urban Walk (Details during registration)**

**21:00- 22:00 Dinner (Details during registration)**

**Wednesday 27 May 2015**
**Cruise: (Details during registration)**

**Thursday 28 May 2015**
**Delphi Visit: (Details during registration)**

**Nicolas Abatzoglou**
Head, Environment Research Unit, ATINER & Professor, Department of Chemical & Biotechnological Engineering, Université de Sherbrooke, Canada, Chair Pfizer, PAT in Pharmaceutical Engineering, Director GREEN-TPV and GRTP-C & P
&
**Jorin-Nicholas Mamen**
Executive Director & Network Manager, BioFuelNet Canada

# Biorefineries and the Canadian BioFuelNetwork: Phase II

**BioFuelNet** Canada Network of National Centers of Excellence integrates the Canadian biofuels research community to address challenges impeding the growth of an advanced biofuels industry towards the future establishment of sustainable biorefineries. There are four major themes:

- Feedstock – focus on non-food biomass (wood, grasses, algae, municipal solid waste)
- Conversion - fuel production from non-food biomass
- Utilization – combustion and emission performance of biofuels and impacts on current and future engine/power generation
- Social, Economic and Environmental Sustainability – LCA, policy assessment, and economic studies which include regional challenges.

In Phase II of the network, there are 10 interlinked disciplinary projects which are integrated into 6 Task forces covering: (1) Biorefineries: thermal and biological; (2) Strategic energy sectors: aviation and forestry and (3) Barriers: policy and low-cost sustainable feedstock.

One out of the 10 projects is **Pyrolysis** which is seen as a technological platform offering many entrance points into biofuel/biorefinery process; more particularly it is a: (1) Process to produce low grade fuels for heating oil and marine vessel fuel; (2) Pre-treatment step to densify materials and generate intermediate products for further refining and (3) Integrated process in biorefinery.

The BioFuelNet Pyrolysis group is aimed at delivering significant knowledge improvement and some ground-breaking incremental solutions towards fast and slow Pyrolysis use as a techno-economically viable process as a function of feedstock, location, and market.

The researchers involved in the Pyrolysis project, the integrated technological components and their roles in this endeavour are summarized below:

**Component 1** related to the use of promising Canadian pyrolysis technologies at bench and pilot scales with various feedstock:

• Franco Berruti (University of Western Ontario): Use of the ICFAR/UWO pyrolysis bench and pilot scale infrastructure for production of oils from low-value grasses. The pyrolytic oils and char are characterized and stabilization efforts through alcohols addition are evaluated.

• Cedric Briens (University of Western Ontario): Use of the ICFAR/UWO infrastructure for the production of bio-oils from pyrolysis of bioconversion residues. Fractionation of bio-oil vapors to produce dry bio-oils.

• Patrice Mangin (Université du Québec à Trois-Rivières): Make the proof that a scaled-up pyrolysis reactor developed at ICFAR/UWO can produce pyrolytic oils that can be used as additives in the industrial partner bitumen products.

• Kelly Hawboldt (Memorial University): Characterization and application of biochar and bio-oils from pyrolysis of residues at lab, pilot and demonstration scales; Development and comparison of a process model for auger pyrolysis.

**Component 2** addresses the upgrading of the pyrolysis liquids. A major roadblock for all pyrolysis technologies is the instability of products over time as well as their variability (heterogeneity) as function of the feedstock and technology used.

• Serge Kaliaguine (Université Laval): (1) Mild hydrogenation pretreatment on a Ru/γ-$Al_2O_3$ catalyst performed prior to HDO on a commercial sulfided Co-Mo/γ- $Al_2O_3$ or CoW/γ- $Al_2O_3$ catalyst; (2) Improving the activity of the hydrodexygenation catalyst by producing and testing high SS γ- $Al_2O_3$.

• Marcel Schlaf (Queen's University): Using the new Canada Funds for Innovation-funded hydrogenation facility at Guelph; expand on previous studies on using Red Mud bauxite mining waste and iron suboxide/magnetite as sacrificial catalysts for the upgrading of pyrolysis bio-oil.

**Component 3**; Nicolas Abatzoglou (Université de Sherbrooke): Develop catalytic routes for the techno-economically feasible valorization of pyrolysis products: (1) evaluate patented catalytic formulations based on Ni- $Al_2O_3$ spinels in reforming and partial oxidation of gaseous and liquid pyrolysis products; (2) continue the work with novel iron and cobalt-based nanocatalysts in a 3-phase slurry Fischer-Tropsch Synthesis reactor.

**Component 4**; Goretty Dias (University of Waterloo): Evaluate the environmental impacts and economic feasibility of fast and slow mobile pyrolysis systems for various feedstock.

**Khaled Abdullah Al-Hajery**
Director, Environmental Protection and Control Department, Royal Commission for Juball and Yanbu, Saudi Arabia

# How Did the Royal Commission Reduce Its Environmental Foot Print

To present real life measures adapted by the Royal Commission to reduce it's ecological footprint by managing its valuable natural resources Mangroves – Coral Reef – Red Sea …etc in a sustainable manner right from the very design stage of the city itself back in the 70s.

The modern city of Yanbu located on the west coast of Saudi Arabia is now a model and trend setter for other cities, where sustainability applications have been introduced long before the introduction of the Concept of Sustainability in the late 80s.

Sustainability is one of the important factors in environmental footprint evaluation, and the Royal Commission was ahead of it's time when it started in 1975, with the formation of 2 new cities with their wide range of attractive sustainable features which can pass any environmental impact assessment by today's standards due to the endless positive outputs on socio-economic ecological and environmental aspects.

Sustainable practices here started long before The Bruntland Report issued by the UN in 1987 with the definition of the modern SUSTAINABLE DEVLOPMENT concept, and is the reference background for all sustainability activities.

Royal Commission's role in preserving it's natural resources sustainable development will be presented with focus on it's solid infrastructure components in both industrial and community zones with built to last specifications – High standards in all industrial projects – Environmental Impact Assessment process for all projects – How to be a green industry – Some examples and case studies of green technologies applied in Yanbu and how they reduce environmental impacts and subsequently the overall ecological footprint.

Also to be shown will be application of sustainability concept right from early planning and design down to construction showing protection of all environmentally sensitive areas which were identified and then considered as a priority at all stages which has led to perfect harmony between industry and environment, thus managing to protect these valuable resources and other environmentally sensitive areas throughout the years.

Turning the dream into reality will be presented as one of the many sustainable aspects of Yanbu, and also to be highlighted is the fact that

Yanbu is a pollution-free city with high quality of life for it's inhabitants, with it's plush green landscaped surroundings, gardens and parks all over the city have transformed it into a livable place with outstanding urban settings while environmental foot print is minimized through continuous action and improvement.

It is quite apparent that even with the current drive toward green and sustainable development by different cities and municipalities, and even the emergence of new mega projects in the middle east, the Royal Commission Yanbu is still in a class by itself in being an existing livable 21st century city that lives up to it's name after more than 3 decades of hard work and dedicated efforts in master planning, with a high score in sustainability, character, identity, recreation, quality of life and a solid long lasting infrastructure set-up.

An annual sustainability report is issued reflecting various practices and achievements in sustainable development in the City of Yanbu.

Energy efficient concepts are one of the Royal Commission planning criteria and there are currently many energy saving applications that are exercised in public projects as well as in heavy and light industries.

It does not end here, and the up-coming future Yanbu will also be featured and all it's prosperous projects and their positive socio-economic and green input to living communities in the whole western region.

**Ali Ariapour**
Academic Member, Boroujerd Branch, Islamic Azad University, Iran
**Elahe Karami**
M.Sc. Graduate, Boroujerd Branch, Islamic Azad University, Iran
**Amir Heidari Jamshidi**
Senior Expert, Jihade Agriculture Organization of Lorestan Province, Iran
&
**Fatemeh Jaidari**
Boroujerd Branch, Islamic Azad University, Iran

# Application of Geographic Information System (GIS) in Soil Erosion Modeling by MPSIAC Method in Boroujerd Rangeland, Sarab Sefid, Iran

From 200 genuses in Lamiacear family there are about 4000 species which one of them is Thymus. Existence of essence in these species is normal that uses for medicinal, nutritional, toiletry and health industry. The genus includes many species in Iran. This study was conducted components of essential oil in biomass of *Thymus kotschyanus*. Samples were collected in Zagheh area when plant was grown as flowering (in Lorestan Province) in 2011. First of all, anatomical investigation by using coloring and then samples in shadow dried and extracted by Clevenger device as Hydrodistilation method were produced. After producing essences, kind of components and percent of essential chemical components recognized and separated completely by using GC and GC/MS devices. According to components retention volume, retention time, Kovats retention index, mass spectrum and comparing those to standard components the results pointed out that 52 components (about 78.87% of essences in species) as main component such as; Thymol (32.77%), Gamma-terpineol (8.43%), Carvacrol (5.61%), Cynol (4.35%), Borneol (4.35%), Cis-Sabinene hydrate (2.87%), 4-terpineol (2.5%) and Gamma-gurjunene (2.17%). This study and most of the other researches had the same results according to main components of essences in the species but deal was different. It may affected by environmental and husbandry techniques such as; time of collecting, place of plant growing and climatic changes of region factors. These factors effect on biosynthesis of essential in time and place.

**Praveen Babu**
Ph.D. Student, Indian Institute of Technology Delhi, India
**Mukesh Khare**
Professor, Indian Institute of Technology Delhi, India
&
**Radha Goyal**
Post-Doctoral Fellow, Indian Institute of Technology Delhi, India

# Chemical Characterization of Airborne Particles Collected in an Underground Metro Station Platform in Delhi City

Transport system in urban land spaces are shifting to underground due to unavailability of space on the surface. Nowadays, underground metro system has become an imperative mode of transport. Since people spend considerable time in underground metro station (UMS), indoor air quality (IAQ) has become an important parameter for investigation. However, maintaining IAQ at UMS has become a major issue for developing countries. Hence, assessment and management of IAQ in UMS is important for healthier indoor environment. The present study includes elemental composition of indoor/outdoor (I/O) particulate matter in a UMS in Delhi city, India during winter season. The study mainly focused on metals and carcinogenic elements. Out of 41 metal analyzed, the main contributors to the indoor pollution at UMS platform and outdoor were Iron at a concentration of 246.37 $\mu g/m^3$ and 25.87 $\mu g/m^3$, followed by Manganese 3.60 $\mu g/m^3$ and 0.77 $\mu g/m^3$, Copper 7.35 $\mu g/m^3$ and 1.51 $\mu g/m^3$, Calcium 128.24 $\mu g/m^3$ and 45.64 $\mu g/m^3$ and Silicon 348.31 $\mu g/m^3$ and 109.67 $\mu g/m^3$, respectively. Further, it has been found that indoor elemental concentrations are higher than that of outdoor environment. The results of this study will help to identify the different sources from various activities within the UMS, in order to select suitable environmental management technique to manage better IAQ in UMS.

**Amita Chaudhary**
Ph.D. Scholar, Govt. Technical Institute, India
&
**Ashok N. Bhaskarwar**
Professor, Govt. Technical Institute, India

# A Novel Ionic Liquid for Carbon Capture

Many chemical processes require use of a solvent. Due to the adverse environmental effects of volatile organic compounds (VOCs), there is a need for replacement of traditional volatile solvents and hence a rising interest among researchers in the field of non-volatile solvents. A large number of chemical reactions are carried out in the presence of a solvent. Recently, a new class of non-volatile solvents has emerged called ***ionic liquids***. An ionic liquid is an organic salt mainly composed of ions which are poorly coordinated, resulting in a low melting point often below 100°C. It consists of an organic or an inorganic bulky cation and a smaller anion. Due to the unsymmetrical ions, the lattice energy and the melting point of the ionic liquids are lower than of inorganic salts. Ionic liquids have many unique properties, such as high thermal stability, large electrochemical window, high solvation capability, non-corrosive and corrosion-preventing nature, high ionic conductivity, and negligible vapour pressure. Their properties can be tailored, and hence ionic liquids have also been termed as the "designer solvents". Ionic liquids can broadly be categorized into protic and aprotic ionic liquids. We have synthesized, and filed a patent on a new low-cost ammonium-based protic ionic liquid by solvent-free acid-base neutralization method. Its physicochemical properties like viscosity and density, and their variation with temperature have been measured, as well as its thermal stability quantified. Its application in carbon capture, considering its great affinity towards the $CO_2$ molecules, has also been explored. Effect of interaction of water molecules with the ionic liquid on its absorption capacity for $CO_2$ has also been assessed. It is found that this novel ionic liquid has the highest absorption capacity to cost ratio compared to all ionic liquids reported to date.

**Nathalie Clement**
Ph.D. Student, IFSTTAR, France
**Bogdan Muresan**
Researcher, IFSTTAR, France
&
**Denis Francois**
Researcher, IFSTTAR, France

# Bioindication of PAHs and Palladium Pollution from Road Traffic

Exhausts from road traffic are causing air and soil pollution. Polycyclic aromatic hydrocarbons (PAHs) and palladium (Pd, an emerging pollutant used in catalytic converters) are associated with emissions from diesel and gasoline vehicles respectively. Only few studies have focused on their effects on roadside ecosystems. Complementary to physico-chemical measures, bio-monitoring can be used to reveal the environmental health. This study aims at evaluating the contamination level of various environmental compartments and identifying relevant organisms for the bio-monitoring of PAHs and Pd impact. First, in order to assess each pollution extent, as well as the role of vegetation cover on both pollutants dispersal, an open field and a forest zone were investigated near a heavy-traffic roadway. Atmospheric PAHs were measured and PAHs and Pd contents were analyzed on soil and indigenous organisms sampled along a 200m-long transect from the road. Second, based on these results and the scarce literature available, four plants were selected to be tested as potential bio-indicators: *Trifolium repens* and *Lotus corniculatus* regarding PAHs; *Festuca arundinacea* and *Lolium perenne* regarding Pd. Tests were carried out with a standard soil in a growth chamber during 60 days. *Trifolium repens* and *Lotus corniculatus* seeds were exposed to PAHs contents from $10^{-6}$ to $10^{-1}$ mg/g. *Festuca arundinacea* and *Lolium perenne* seeds were exposed to Pd contents from $10^{-3}$ to 10 mg/g. Such contents encompass the values measured previously in the roadside soils and organisms. Blanks tests with no pollutants were also carried out. Traits related to germination, aerial and underground parts, as well as physiology (leaf fluorescence) were regarded. Results show that *Lotus corniculatus*, could be a potential bio-indicator of PAHs through the number of leaves and flowers. *Festuca arundinacea* and *Lolium perenne* could also be bio-indicators of Pd through the number of leaves and/or the plant height.

**Rallou Dadioti**
PhD Researcher, De Montfort University, U.K.
&
**Simon Rees**
Reader in Architectural Engineering and Renewable Systems,
De Montfort University, U.K.

# Wind Power Resource Assessment in Urban Environment Based on Computational Fluid Dynamics Modeling

Micro wind turbines applications have not yet revealed their great potential for green house emission reduction, since there is no a rigorous methodology and adequate wind assessment criteria for accurately predicting their energy yield. The complexity of urban environment makes the modeling of urban wind flow characteristics more difficult.

Computation Fluid Dynamics (CFD) models for external flows calculation in urban areas have been developed for wind energy studies, but validation testing is required for extended use and application growth. In this work we test numerical models using the OpenFoam, an Open Source CFD library, and examining a number of benchmark data sets developed by the Architectural Institute of Japan. Data derived from wind tunnel experiments and field measurements is used to examine the performance of steady and unsteady Reynolds averaged Navier-Stokes equations (RANS) models as well as Detached Eddy Simulation (DES) approaches. The later looks very promising to improve the predicting potential of turbulence models combining features of classical RANS models with Large Eddy Simulation methods (LES). Afterwards, using a combination of the simulated wind velocity, meteorological data and the characteristics of wind turbines we create a novel methodology to produce a 3D annual wind map to indicate the areas with the maximum wind potential and estimate the energy yield.

**Sonia Damyanova**
Professor, Institute of Catalysis, Bulgarian Academy of Sciences, Bulgaria
**Adriano Braga**
Federal University of Sao Carlos, Brazil
**Joao dos Santos**
Federal University of Sao Carlos, Brazil
&
**Jose Maria Buenno**
Federal University of Sao Carlos, Brazil

# Hydrogen Production by Ethanol Steam Reforming

Hydrogen produced from renewable resources is identified as an ideal energy carrier to support sustainable energy development since its combustion does not produce any emissions of carbon dioxide but only water. Among the various feedstocks for hydrogen production, the biomass derived ethanol is very attractive because of its relatively high hydrogen content, availability, non-toxicity, and storage and handling safety. The success of converting bioethanol into hydrogen is highly dependent on the efficiency of involved catalytic reaction path ways and on the kind of used catalysts. Presently, the most used catalysts for ethanol reforming processes are Ni-based catalysts, having high initial activity, but they undergo fast deactivation caused by coke formation. The progress in these direction, points to tailoring of nanoscale materials with controlled particle morphology, dispersion and electronic properties. The subject of present work was to evaluate the structure, electronic and catalytic properties of $MgAl_2O_4$-supported Co, Ni and CoNi catalysts for ethanol steam reforming to hydrogen. The samples were characterized by $N_2O$ chemisorptions, XRD, EXAFS, XANES, TEM and TPD of adsorbed ethanol. The test reaction of ESR was carried out at temperature interval of $250^0$-$750^0$C and ratio $H_2O/C_2H_5OH$ of 3/1. It was shown that the different behavior of catalysts in the C-C breaking depends mainly on the oxidation state of metal components. The results of in-situ temperature resolved XANES study at Ni and Co K-edges during the reduction and ESR reaction at $500^0$ and $550^0$C were in agreement with the data of reaction evaluation as a function of reaction temperature. It was detected that the acetaldehyde production is large when the oxidation degree of metal components is maximum, i.e. the ethanol oxidative dehydrogenation takes place. Increasing the degree of metallic area in Ni and CoNi catalysts leaded to easily C-C bond cleavage, producing CO, $CO_2$ and $H_2$.

**Sofia Djerdali**
Professor, University Ferhat Abbes, Algeria
&
**Francisco Sanchez Tortosa**
Professor, University of Cordoba, Spain

# Anthropogenic Food Subsides Enhance Egg Volume and Hatching Mass of White Stork *Ciconia Ciconia* in Northern Algeria

Increased egg size in birds through food supplementation has been linked to improved hatching success, increased size at hatching, early growth and nestling survival. Dumps are considered one of the three main predictable anthropogenic food subsidies which sustain a large number of animal species including White Stork.

The aim of the present study is to evaluate the effects of extra food from waste dumps poultry that are expanding in the study area and used by the white stork as a new protein resource to test the effect of this extra food on egg volume and hatching mass. Breeding performance was recorded over a three year period (2002–2004) in 14, 20 and 36 nests. White Stork colonies (Northern Algeria 35°49´N, 05°31´E; 900 m.a.s.l.), situated close to chicken farms were considered to be part of a "pseudo-experiment where parents had access to extra food.

Results of the two linear mixed models showed a significant effect of extra food on both egg volume and hatching mass. The reproductive value of last laid eggs (4th and 5th) doubled when females had extra food. Lower egg size of last laid eggs has been selected as a mechanism to facilitate early brood reduction in the White Stork. On the contrary when females had extra food last laid eggs were as big as first eggs where extra food was not available what may enhance the provability of survival for chicks from latest eggs in the brood.

**Deniz Dolgen**
Instructor and Professor, Dokuz Eylul University, Turkey
&
**Mehmet Necdet Alpaslan**
Professor, Dokuz Eylul University, Turkey

# Greenhouse Gas Emissions (GHGs) Related to the Wastewater Treatment Plants

In recent years, there is an interest to identify carbon footprints from wastewater treatment plants in terms of GHGs emissions, energy and natural gas usage, and energy production. The estimation of GHGs emissions from wastewater treatment plant is a relatively new attempt, and different models have been used to describe the GHG-related mechanisms in wastewater treatment. These models can be subdivided in three main groups. The first group corresponds to empirical models that are used to make inventories and that provide an order of magnitude of the production of greenhouse gases. The second group includes simple comprehensive process models for wastewater. Finally, the third group of models consists of mechanistic models that dynamically describe the production of certain greenhouse gases.

The main objective of the presented study is to quantify the GHG emissions for a wastewater treatment plant. In this framework, methods used in GHG estimations are discussed briefly. Off-site and on-site GHG emissions generated from a typical WWTP is calculated using emission factors. The main emissions are taken as carbon dioxide and nitrous oxides which are yielded from the aerobic treatment of wastewater; plus methane which is the end product of anaerobic treatment. However methane itself does not considered directly, because almost all the methane are converted to carbon dioxide and nitrous oxides during the energy generation. Besides the treatment process itself, auxiliary facilities and operations causes GHGs particularly in terms of energy consumption As a result, in the paper principal GHG sources from the waste water treatment plants are reviewed, and mitigation measures to reduce the emissions and energy consumption are discussed.

**Tayel El-Hasan**
Professor, Mutah University, Jordan

# The Environmental Consequences of the Oil Shale Utilization in Jordan: The Effect of Combustion Processes

The geochemical analysis of the upper Cretaceous organic rich oil shale of El-Lajjoun revealed that it contains considerable concentrations of trace element when compared to the average world shale. The aim of this study was to deduce the effect of various combustion processes on the geochemical and mineralogical characteristics of the produced ashes.The oil shale powder samples were burned under Aerobic Combustion Process (ACP) at 700˚C, 850˚C and 1000˚C respectively, beside the anaerobic (pyrolysis) combustion process (PCP) at 600, 650, 700, 750 and 800˚C respectively.The ashes produced from the (ACP) caused almost all major oxides contents to increase with increasing burning temperature, particularly $SiO_2$ and CaO were nearly doubled at temperature 1000 ˚C. Moreover, trace elements showed the same trend where ashes at higher temperatures (i.e. 1000 ˚C) have doubled its contents of trace elements such as Cr, Ni, Zn, Cu and U. This was reflected through enrichment of calcite and quartz beside the anhydrite as the main mineral phases in the ACP ashes.

As for the PCP ash show similar trend but relatively with lower concentrations as evident from its lowerEnrichment Factor (EF) values. This might be due to the higher organic matter remained in the PCP ashes compared with ACP ashes. However, PCP is more likely associated with toxic Cd and Asgasses as evident from their lowerconcentrations in the ashes.Moreover, recent results using the synchrotron-based XANES technique confirm that toxic elements are found in higher oxidation state due to ACP. The investigation was concerned on As and Cr. Thechromium in the original shales was in the form of Cr (III) and then it was converted to Cr (VI) in the ashes due of the ACP. Similarly, As (III) the XANES results showed that it was converted into As (V) too. These findingsare alarming and should be taken seriously. Because elements with higher oxidation states became more mobile, thus they can easily leached from the ash tailing into the nearby water resources. The most important species is Cr (VI) because it is easily leachable and very harmful species. It could cause pollution to surface and ground water resources.Therefore, allot of concerns should be paid on the ongoing oil shale utilization enterprises due to its pollution potential.Further investigation regarding the speciation of vanadium and cadmium are on the way.

**Damien Evrard**
Ph.D. Student, Mines Saint-Etienne, France
**Valerie Laforest**
Professor, Mines Saint-Etienne, France
**Jonathan Villot**
Lecturer, Mines Saint-Etienne, France
**Rodolphe Gaucher**
Head, Unit "Clean Technologies" INERIS, France
**Natacha Darmon**
Head, Group Regulation & Installations, EDF-CIDEN, France
&
**Sofia Bouhrizi**
Engineer, EDF-CIDEN, France

# Identification of Representative Installations to Determine Best Available Techniques: A Methodological Proposal

Best Available Techniques (BATs) in Europe have become crucial for the industrial sectors concerned with the Industrial Emission Directive (IED) and for other sectors like the nuclear industry. In the IED, the creation and revision process to define a list of BATs which will be used as a reference by operators and environmental authorities is known as the "Sevilla Process". The decision process is based upon exchange of information between stakeholders, analysis of data and expert judgement. Several methods to assess technique performances compared to BATs from reference documents or to support the determination and the application of BATs have been developed. However, existing tools integrate either the European or the local level but not both levels. This situation makes the application of BATs highly dependable of expert judgements. In order to contribute to strengthen the robustness of BAT determination and application, the authors argue that there is a need for an integrated method to help to define a list of BATs and to support the decision for their application.

This paper first introduces the context in which the BAT concept is used. In a second section, a methodological approach to analyse an industrial sector so as to identify its key environmental issues is presented. Then, the results of this sectoral analysis are used to select installations considered as representative of these issues in a view of illustrating the current situation in the sector and fuelling the discussions between experts. To illustrate the latter section, examples from the Food Drink and Milk and the nuclear industry are given. Finally, the proposed methodology to analyse an industrial sector and

to select installations which are representative of key environmental issues is discussed and perspectives for selecting BATs are given.

**Young Hong**
Ph.D. Candidate, University of Sydney, Australia
&
**Marjorie Valix**
University of Sydney, Australia

# Transforming the Recycling of E-Wastes with Thiosulfate

This study compared the leaching of copper from copper-rich electronic waste in sulphuric acid and ammonium thiosulphate lixiviants. The efficiency of thiosulfate media was manifested by the rapid dissolution of copper resulting in 99% Cu recovery in 15 hours at 30°C leached with 0.14M thiosulfate with pulp density of 10g/L. Whilst under the same conditions, sulphuric acid only dissolved 2% of copper. Increasing the temperature of leaching to 40°C, 60°C and 90°C in sulphuric acid increased the recovery. Optimal copper recovery of 99% was achieved at 90°C in 8 hours with 0.1M of acid. Furthermore the copper selectivity (mole/mole) in thiosulphate was 54.16 whereas in sulphuric acid it is only 26.44. Assessment of the leaching behaviour of copper in sulphuric acid showed it was influenced by precipitation in the form of copper hydroxide. Sulphuric acid depolymerises the epoxy in e-waste to form bisphenol – a precursor for precipitation. The formation of the copper precipitate robs the leachate of the dissolved metal. It appears the low reduction potential in thiosulfate removed dissolved iron as magnetite. This secondary reaction, however, did not affect copper recovery in thiosulfate and because epoxy is inert in thiosulfate no decomposition product was formed to affect the overall leaching. In fact the removal of iron improved the selectivity of the leaching process. These results demonstrate the greater efficiency of thiosulfate lixiviant in leaching copper from electronic waste.

**Ana Kalemaj**
Secretary, Faculty of Natural Scinces, Tirana University, Albania
&
**Mirela Lika**
Professor, Tirana University, Albania

# Food Allergy in the Students of Tirana City Ranging from Age 6 to 10

The term food allergy is widely misused for all adverse reactions to food. Food intolerance (FI) are all other adverse reactions to food. Some proteins or fragments of proteins are resistant to digestion and those that are not broken down in the digestive process are tagged by the Immunoglobulin E (IgE). Food allergies are increasing in prevalence at a higher rate than can be explained by genetic factors, suggesting a role for as yet unidentified environmental factors.The intestinal epithelium forms the interface between the external environment and the mucosal immune system, and emerging data suggest that the interaction between intestinal epithelial cells and mucosal dendritic cells is of particular importance in determining the outcome of immune responses to dietary antigens.

Albanian students from 6 to 10 years of age were considered as representative sample of Tirana students' population. During the period Febray 2014 - Febray 2015, the students have filled in the forms prepared and distributed by us about the food which were used by them and bout the irritation from the different food. Individuals who resulted to be allergic to food were subjected to further analysis in order to determine the total IgE, in the ELISA serum and simultaneously it was defined level of eosinophiles in the blood.

The percentage of positive cases coincides with previous studies, where the result of this food allergy cases has been resulted about 9%. In most cases students of this age are allergic to eggs. In some cases of allergies which are caused mainly by the protein of egg yolk. Further foods that cause allergies are sea products such as fish or shellfish. After them come peanuts and tree nuts and in the end, there are fewer cases which are allergic from soya. Almost in all the cases of children who are allergic to various foods, levels of IgE increase, which otherwise is called allergic immunoglobulin, we notice also an increase of eosinophiles as polymorph nuclear leukocytes, which emit the contents of granules that help in the emergence of allergic signs.

**Andrzej Kornas**
Professor, Pedagogical University, Poland
**Zbigniew Miszalski**
Professor, Jagiellonian University, Poland
&
**Maciej Kocurek**
Ph.D., Jan Kochanowski University, Poland

# Photosynthetic Activity of Stems in Two *Clusia* Species

Photosynthetic cells surrounding the vascular system are supplied with either malate or $CO_2$ from the xylem vessels and they possess high activities of decarboxylating enzymes releasing $CO_2$ for photosynthesis. $CO_2$ reduction in these cells leads to elevated internal oxygen concentration and supports the formation of reactive oxygen species (ROS). Ascorbate peroxidase (APX) activity in veinal cells of $C_3$ and CAM plants differ significantly, in favour of CAM (Crassulacean acid metabolism) plants. In photosynthetic cells surrounding the vascular tissue of CAM plants, APX could contribute to the mechanisms of ROS overproduction avoidance and to protection against photoinhibition of PSII. We found that photosynthetic cells around the xylem and phloem in $C_3$ plants show characteristics of CAM photosynthesis. A metabolic shift toward β-carboxylation in those vascular photosynthetic cells in $C_3$ plants was manifested by the enhanced expression level of NADP-malic enzyme (NADP-ME) gene. NADP-ME also produces NADPH for detoxification of stress-induced reactive oxygen species. Genes for $H_2O_2$-scavenging enzymes, *cat2* and *apx1*, show lower expression in leaf mid-rib parts than in mesophyll. Processes involved in the regulation of $H_2O_2$ level in both leaf parts depend on photosynthetic processes and are coordinated but not parallel.

*Clusia multiflora* Kunth. described as an obligate $C_3$ and *Clusia rosea* Jacq. as an obligate CAM plant. Photosynthetic gas exchange, xylem $CO_2$ concentration, chlorophyll distribution, $^{13}C$ discrimination, daily malate and citrate fluctuations and the abundance of Rubisco (ribulose-1,5-bisphosphate carboxylase/oxygenase) and PEPC (phosphoenolpyruvate carboxylase) proteins were measured in leaves and stems. In stems of both species a low $CO_2$ efflux (in the range of 0.05–0.1 lmol $m^{-2}$ $s^{-1}$) was observed as a result of extremely low cork conductance for water vapour (0.15–0.2 mmol $m^{-2}$ $s^{-1}$). This led to the $CO_2$ concentration in xylem sap reaching 5.2 ($CO_2$) mmol $l^{-1}$. Moreover, western blotting analyses proved the presence of RubisCO in the stems of both Clusia species; however, PEPC was only found in *C. rosea*.

Additionally, daily fluctuations in the concentration of citrate and malate (higher than in leaves) and significant enrichment in $^{13}C$ in *C. rosea* stems were observed.

In stems of *Clusia,* $CO_2$ concentrated in xylem sap in CAM tree can be fixed with PEPC and Rubisco while in $C_3$ tree only Rubisco can participate in this process.

The results will be discussed in relation to the functional differences between mesophyll cells and photosynthetic cells surrounding the leaf vascular system.

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**Bhaskar Kura**
Professor, University of New Orleans, USA

# Promoting Sustainability at the World Ports: Research Efforts at the University of New Orleans

Maritime Environmental Resources and Information Center (MERIC) was established at the University of New Orleans (UNO) to promote environmental excellence, occupational safety, and cleaner /sustainable production within the maritime industry. MERIC's strategic location at UNO (Gulf Coast) draws synergy from the presence of (a) nationally ranked Naval Architecture and Marine Engineering (NAME) program, (b) Civil & Environmental Engineering program, (c) an active maritime industry with a number of medium and large scale shipbuilders, boat builders in the Gulf Coast, and (d) off-shore oil & natural gas exploration and production activities.

Over the last 15+ years, MERIC researchers worked on a number of projects focusing on shipbuilding processes such blasting/paint removal, painting, welding, cutting, and more. Several decision support systems were developed for protecting the environment, public health, worker health and also to comply with the regulations while minimizing the life cycle costs. MERIC's recent efforts included promoting sustainability at the World Ports through applied research, education, and knowledge-sharing. A modest beginning was made with a five-year contract with the Port of New Orleans, and efforts are being made to collaborate with ports around the World. This paper presents MERIC's efforts and strategies for promoting sustainability at the World Ports through (a) research, (b) education, (c) collaboration, (e) decisions support system/tools, and (f) knowledge-sharing.

**Zeyu Ma**
MSc Student, Beijing Forestry University, China

# The Distribution of Concentration of PM2.5 in Different Regions of Beijing in Summer and Autumn

Seven typical monitoring points were selected to monitor the concentration of PM2.5 in Beijing during four months. This study was focused on the differences of the distribution of PM2.5 in different regions. Where the highest concentration of PM2.5 was at High level of Urbanization Area, and the concentration in south region of Beijing (Daxing) was higher than that in north region (Changping and Miyun). The average concentration of PM2.5 at Daxing is 68.85μg/$m^3$, which at Changping is 54.51μg/$m^3$.The mean concentration of PM2.5 in autumn was higher than that in summer in Beijing, and the minimum was in August (52.94μg/$m^3$) , the maximum is in October (76.14μg/$m^3$). The impact of vehicle emissions on Beijing PM2.5 concentrations were significantly. Suitable structure vegetation could help prevent PM2.5 effectively.

**Li Mo**
Master Student, Beijing Forest University, China

# Deposition of Size-fractionated Particulate Matter in Cuticle of Urban Plants

Particulate matter (PM) accumulation on leaf has been studied in many researches, while most of them were focus on the PM deposition on leaf surfaces. In dry and windy periods, the (dry or wet) deposition of PM on the leaves may have a chance to be blown into the air again. However, the PM encapsulated into the cuticle of plants will not be influenced by resuspension. In this paper, for studying the adsorption effect of plant leaves waxy layer of size-fractionated particles, five plants (four trees, one shrub) were collected during their growing season (April till September), and measured the accumulation of PM in cuticles of the samples. The distribution of different particle size fractions differed between and within species in waxes. The in-wax PM accumulations were on the rise with plant growth, the most effective specie was *Catalpa speciosa Ward.* with 31.77μg/cm$^2$ total PM, while the total PM accumulations of the other four plants were all less than 10μg/cm$^2$. The accumulation of fine particles (0.2-2.5μm) in cuticles of all the samples showed no obvious regularity on monthly variation. Large PM (10-100μm) accumulated in plant cuticle concentrated on the range of 2.5-10μg/cm$^2$, coarse PM (2.5-10μm) accumulation focused on the range of 0.5-1.5μg/cm$^2$, and fine PM accumulated mostly on the range of 0.5-2μg/cm$^2$. The cuticle of plant leaves has obvious effect on adsorpting atmosphere PM.

**Raul G.E. Morales**
Chairman, Centre for Environmental Sciences, University of Chile, Chile
**Richard Toro**
**&**
**Manuel A. Leiva**

# Critical Episode Patterns of Atmospheric Pollution by Particulate Matter at Santiago City, Chile

Every winter critical episodes of urban atmospheric pollution by $PM_{10}$ and PM2.5 airborne particles in different urban local zones at Santiago city, the metropolitan capital of Chile, are registered. Whenever the city has been defined as saturated zone by PM-10, the grow up of its urban radii and an increasing population which reaches 6 million of inhabitants, have no permitted to observed good results respect to the numerous achievements in social politics of the city government.

Since 1997 the MACAM-2 network of eight air quality stations distributed in some appropriate places of the city are daily measuring $PM_{10}$ and several other gases such as NOx, $O_3$, CO, $SO_2$, as well as, meteorological parameters, in real time. According to the present Chilean quality air act, the mean average of the 24 last $PM_{10}$ hourly concentration measurements (24-$PM_{10}$) defines the good, bad and critical air quality. This 24-$PM_{10}$ parameter is generated every hour as a mobile indicator in order to determine the air quality level of the city. However, our observations of the last decade show that this parameter is permanently delayed from 8 to 12 hours at least of the real pollution situation that involve to the mot affected districts.

Furthermore, in the present work we have analyzed the critical episodes of PM-10 observed in the last decade, in order to determine the main frequent and characteristic patterns of critical episodes of urban atmospheric pollution. From these data we have categorized four typical patterns of critical episode evolutions, which are being observed winter by winter through a week of time every one, approximately. In general, we have observed that the critical episodes occur in the night, after 19.00 h., probably due to the diminution of the surface temperature, as well as to the accumulative effect of the primary pollutant concentration emitted and the secondary pollutant produced during the day.

The $PM_{10}$ concentration measurements have been obtained from the MACAM-2 network database of the Ministry of Health. The $PM_{10}$

concentrations were determined by means of a TEOM (Tapered Element Oscillating Microbalance) equipment, from Thermos Co., U.S.A., which provides data every 5 min at 50°Celcius degrees.

**Kamchai Nuithitikul**
Associate Professor, Walailak University, Thailand
**Sarawut Srikun**
Postgraduate Student, King Mongkut's University of Technology North Bangkok, Thailand
&
**Samorn Hirunpraditkoon**
Associate Professor, Naresuan University, Thailand

# Synthesis of Activated Carbons from Durian Peel and Their Adsorption Performance for Lead Ions in Aqueous Solutions

In this research, activated carbons were synthesized from durian peel based on physical activation method using carbon dioxide as the activating agent. In the carbonization process, nitrogen atmospheric or vacuum pyrolysis was carried out and the properties of activated carbons synthesized from either pyrolysis process were compared. The synthesized activated carbons were used for the removal of lead (II) ions from water. The characterization of the synthesized activated carbons included the yield (determined by weighing), specific surface area, pore volume and average pore diameter (determined by nitrogen adsorption), iodine numbers (based on ASTM D4607-94), methylene blue adsorption capacity (based on JIS K1474-1991) and the surface functional groups (determined by Fourier Transform Infrared (FTIR) spectroscopy). The results showed that the durian peel-derived activated carbon synthesized under vacuum pyrolysis had better performance than that synthesized under nitrogen atmospheric pyrolysis for the removal of lead ions. Although the durian peel-derived activated carbon synthesized under vacuum pyrolysis had greater specific surface area than a commercial activated carbon derived from coconut shell, its adsorption capacity for lead ions was lower. There are other factors apart from specific surface area that can significantly affect the adsorption capacity.

**Radostina Palcheva**
Assistant Professor, Institute of Catalysis, Bulgarian Academy of Sciences, Bulgaria
**Barbara Pawelec**
Institute of Catalysis and Petrochemistry, Spain
**Eric Gaigneaux**
Universite Catholique de Louvain, Belgium
**Jose Luis Fierro**
Institute of Catalysis and Petrochemistry, Spain
&
**Sonia Damyanova**
Professor, Institute of Catalysis, Bulgarian Academy of Sciences, Bulgaria

# Hydrogen Production from Renewable Resources

A very attractive and promising issue is the conversion of waste biomass into energy or raw material as biogas via anaerobic digestion. For successfully reforming of biomass derived biogas to hydrogen and/or synthesis gas highly effective catalysts have to be developed. As a transition metal, Ni-based catalysts exhibit high activity in reforming processes to hydrogen and are cost-effective in comparison with noble metal-based catalysts. However, they undergo fast deactivation caused by coke formation and sintering of active phase. The objective of present work was to explore the effect of $CeO_2$ addition to alumina-supported Ni catalysts on their structure, surface properties and catalytic performance. Mixed oxides by modification of the surface of γ-$Al_2O_3$ with different concentrations of lanthanoide oxide, $CeO_2$, (1-12 wt%) and supported on them monometallic Ni catalysts were obtained. The samples were characterized by different methods: $N_2$ adsorption-desorption isotherm, UV-vis DRS, XRD, XPS and TPR. The test reaction of methane reforming with carbon dioxide was carried out at atmospheric pressure, reaction temperature of $550^0$C and $CH_4/CO_2$ ratio of 1/1. The redox properties of mixed oxides ($x$$CeO_2$-$Al_2O_3$) in consecutive cycles of reduction and oxidation at different temperatures were defined. The results showed that the different nature of Ni-support interaction in Ni/$Al_2O_3$ and Ni/x$CeO_2$-$Al_2O_3$ catalysts causes a different dispersion and reducibility of the both, nickel oxide and $CeO_2$. It was concluded that an optimal interaction between the active metal Ni particles and oxygen vacancies of the surface of mixed $x$$CeO_2$-$Al_2O_3$ oxides is responsible for the high catalyst activity and stability as a result of the enhanced dispersion of the active metal phase and resistance to coke formation. The mechanism of catalyst deactivation due to the coke deposition was evaluated.

**Jean Paris**
Professor, Polytechnique Montreal, Canada
**Mariya Marinova**
Researcher, Polytechnique Montreal, Canada
&
**Michel Perrier**
Professor, Polytechnique Montreal, Canada

# Forest Biomass and Paper Industry, a Pathway to Green Biofuels

The Canadian forest can be an abundant source of renewable biomass with a nil carbon imprint provided the annual new growth of biomass is equal, or superior, to the amount harvested. The pulp and paper (P&P) industry in industrially mature countries has been facing difficult economic conditions for some time due to a declining demand for commodity papers. During the last two decades, the Canadian P&P industry has investigated the possibility to modify its current equipment and infrastructure so that they may be used to separate the components of wood and convert them into novel non paper bioproducts. This work has led to the concept of integrated forest biorefinery. The three main components of wood that can be processed in a biorefinery are cellulose, hemicelluloses and lignin.

Cellulose and hemicelluloses are polymers of pentose and hexose sugars. Both polymers can be hydrolyzed into sugar monomers following a conditioning pretreatment and the monomers can then be fermented into alcohols. Two case studies have been performed to establish the pre-engineering feasibility of producing ethanol and butanol from an operating Canadian Kraft mill. An experimental program was conducted to remove the fermentation inhibitors present in the pre-hydrolysate and concentrate the sugars by novel technologies based on nanomembrane separations and flocculation. An optimal sequence of operations was developed. Also, it was shown that the production of butanol could be increased by enriching the fermentation medium with extracts from a common fodder. A simulation model of the two processes was developed on the ASPEN Plus software and the potential for the heat and mass integration of the conversion unit and Kraft receptor mill was evaluated.

Lignin is a complex three dimensional polymer consisting primarily of phenyl propane units. It has a relatively high calorific value and can be combusted to generate heat and power. It can also be converted into liquid transportation fuels through gasification, pyrolysis and Fischer Tropsch pathways. The first step of the Kraft pulping process is the

delignification of wood chips to liberate cellulose fibers forming the pulp. This is accomplished by chemical action under strong alkaline and high temperature conditions. The solubilized lignin is entrained by the spent delignification liquor (black liquor, BL) which is concentrated and burnt to produce heat and power. In the integrated forest biorefinery, the lignin can be precipitated by the acidification of the BL, purified and dried and used as a precursor to the vast phenolic platform of chemical pathways. Two parallel case studies using drastically different acidification techniques have been undertaken; one consists of sparging $CO_2$ in BL and the other uses electrodialysis with a bipolar membrane to separate a lignin enriched stream from a caustic soda enriched stream. It has been found that the behavior of the generated particulate lignin controls the efficiency of both techniques and remedial action are being investigated.

The integrated forest biorefinery can clearly be an attractive option for the P&P industry to diversify its product portfolio to penetrate new markets and regain profitability. There are clearly significant technical challenges to be overcome on the way. The scientific community must play a leading role in this journey.

**Thirawudh Pongprayoon**
Associate Professor, King Mongkut's University of Technology North Bangkok, Thailand

# Oil Removal from Contaminated Soil by Surfactant

One of the organic-contaminated soils is from oil spill. To remove oil from soil, using surfactant has been interested to use according to simple process and economy. In this study, three oils consisting of gasoline, diesel and vegetable oil were absorbed in soil as the oil-contaminated soil samples, and three common surfactant consisting of sodium dodecyl sulphate (SDS), linear alkyl benzene sulfonate (LAS) and cetyldodecyl triammonium bromide (CTAB) were used for soil remediation. Surfactant concentration and flushing were the parameters to investigate the optimum.

The contaminated soils from three different oils were prepared by mixing 2.5 kg soil with 2 L oil. The surfactant concentration of 0.5, 1.0 and 1.5 CMC of each surfactant was observed with the flow rate of 5 and 10 L/min.

The results showed that the optimum condition of each studied surfactant was the same at 1.5 CMC concentration with 10 L/min flushing, when the removal time was 100 s. SDS was the best surfactant to remove all studied oil from contaminated soil, comparing to LAS and CTAB in this experiment. The oil removal efficiency of using SDS at the optimum condition was 99% for gasoline, 67% for diesel and 40% for vegetable oil. The efficiency of using LAS was lower, while the efficiency of using CTAB was the lowest.

**Carolus Prasetyadi**
Lecturer, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Indonesia
&
**Adi Sulaksono**
Graduate Student, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Indonesia

# Jogja National Geopark and its Brilliant Policy

Nowadays, Jogja National Geopark is the newest geopark in Indonesia. It has recently been established by the Geological Agency of Indonesia. It is situated in the Special Region of Yogyakarta (Indonesian: *Daerah Istimewa Yogyakarta*, or DIY), a region of Indonesia in the Java island. It consists of ten geological sites (one in neighbor region), historically records Java island formation. Generally, according to these sites, its geological history can be divided into five periods: 1) Merging of Eastern Java Microcontinent (EJM) with Sundaland; 2) Pre Island Arc; 3) Island Arc; 4) Post Island Arc; 5) Present Day Volcanic Arc.

The merging of EJM with Sundaland is recorded by the exposed high pressure Cretaceous metamorphic rocks that are formed in the suture environment. Pre island arc period (marine environment) that occurred in Eocene is indicated by the present of Nummulites and Dyscociclina rich limestone that is relatively easy to recognize. Island arc period that occurred in Oligocene – Miocene is known by the ancient volcanic arc, composed by basaltic pillow lava at the lowest part and various rocks that indicated how wonderful volcanic activity at that time. At the end of that period is marked by the formation of widespread distribution limestone above the Oligocene – Miocene volcanic rocks. Present day, Java island is active volcanic arc and the most active volcano is located in DIY, one of ten established sites.

A long time ago before this geopark had been established, people who live at the surrounding area were not appreciated its account and significance. They did not realize how priceless it is. People had mined its rocks compiler, littering at the site especially the site which located in the river and doodling by permanent marker. Government had tried to prevent in many ways and finally people became more appreciated because of that establishment.

**A. Rivard**
Graduate Student, Texas A&M University at Galveston, USA
**J. Mileski**
Department Head, Maritime Administration, Texas A&M University at Galveston, USA
&
**M. von Zharen**
Regents Professor, Department of Marine Science, Texas A&M University at Galveston, USA

# All Aboard: The Wicked Problem of Marine Spatial Planning

Marine spatial planning (MSP) has been well accepted in Europe. However, along the coast of the United States, MSP is voluntary and has yet to be fully embraced by all coastal states. The problem of planning for the efficient and effective stewardship of the marine environment is a "wicked problem," one that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize; for example, there isn't a central coordinating authority with voluntary participation of all stakeholders associated with port activities, shipping lanes, commercial fishing, recreational fishing and other uses of the water, extraction of natural resources such as oil and gas.

This paper addresses how a "convergence of goals of all stakeholders" approach can be used to mitigate the "wicked problem'" of MSP in the voluntary system of the United States. We use a case study of the Texas Intracoastal Waterway to address on aspect of the wicked problem: hazards to navigation. The adoption of this non-coercive, flexible approach initiates and maintains stakeholder engagement through the use of an overt but nonthreatening action of a catalyst. This dynamic process shows that voluntary involvement by stakeholders can mitigate at least some aspects of the wicked problem of MSP.

Various methodologies including physical observation, surveys, and analysis of archival data, are used to collect information and engage stakeholders to identify and mitigate hazards. Further, the process creates a dynamic set of best practices of coastal land and water usage. Addressing incremental parts of the "wicked problem" can serve as a template for developing an MSP strategy to protect the marine environment, enhance the marine transportation system, and create safety for all parties.

**Krassi Rumchev**
Discipline Leader, Curtin University, Australia
**D. Bertolatti**
Curtin University, Australia
**B. Mullins**
Curtin University, Australia
&
**I. Chakma**
Curtin University, Australia

# Concentrations and Elemental Compositions of Airborne Particulate Matter in Perth Metropolitan Area, Australia

Particulate Matter (PM) as a "criteria pollutant" is an important indicator of air quality in Australia and worldwide. Although air quality in Perth, Western Australia is considered very good, the evidence show that PM exposure levels exceed the national standards in numerous occasions. The aim of the study was to compare concentrations and elemental composition of ambient PM between different locations within Perth, Western Australia in winter of 2012. Three locations were selected within Perth Metropolitan area. The first location was close to a busy road, the second site was located near an industrial area and the third location was the control site situated in a quiet suburb. State of the art equipment including NanoMoudi-II 125b, DustTrak DRX 8533b, CPC 3775 and P-Trak were used to collect airborne particulate matter with size less than 10 µm (PM10), PM less than 2.5 µm (PM2.5), PM less than 1 µm (PM1.0) in aerodynamic diameter, and particulate number concentrations (PNC). Relative humidity and temperature were also collected using a TinyTag Ultra 2TM data logger. Ambient concentrations of Carbon Monoxide (CO), Nitrogen dioxide (NO2), Ozone (O3), Sulphur dioxide (SO2) and total rainfall data were obtained from the Department of Environment and Conservation (DEC). Elemental analysis of samples for Carbon (C), Hydrogen (H), Nitrogen (N), and Sulphur (S) were carried out by a flash elemental analyzer. Univariate and bivariate statistical analyses were conducted to obtain measures of central tendencies as well as correlations between the pollutants. There were statistically significant differences between exposure levels of PM1.0, PM2.5 and PM10 as well as the PNC levels between the three sites with the highest concentration measured at the industrial site although it didn't exceed the national guideline values. Significant differences in PM1.0 and PM2.5 levels were observed between weekdays and weekends for the industrial site

but not for the other sites. According to the elemental composition analysis, the highest proportion of elemental carbon was measured near the Industrial site (28.30%). Results from the statistical analyses confirmed that people who live near industry are exposed to higher concentrations of PM followed by those who live near busy roads and therefore they may be at risk for the development of adverse health effects.

**Aicha Sebti**
Ph.D. Student and Researcher, Unité de Développement des Equipements Solaires, EPST CDER, Algeria
**Boutra Belgacem**
**Lebik Hafida**
**Medjene Farid**
**Igoud Sadek**
&
**Aoudjit Lamine**

# Numerical Simulation of Solar Reactor for Water Disinfection

Numerical modeling and simulation are indispensable tools to improve performance of solar reactor for water disinfection and contribute to the development of new processes.

Solar water disinfection or photolysis is an old process which exists since 1910th, but it's only from 1970th that researchers have interested to understand the mechanism governing the destruction of pathogenic microorganisms by solar irradiation.

When contaminated water is exposed to natural or artificial ultraviolet irradiation, UV will break the molecular bonds within microorganism's DNA and destroy them, rendering them harmless or prohibiting growth and reproduction. Time required to achieve a total disinfection depends both on the quality of water and the intensity of irradiation.

The kinetic of disinfection or bacterial response to UV irradiance have been described by several models. The basic model is the Chick-Watson model where a pseudo first order rate expression was established and in which the overall rate of photo reaction is directly proportional to UV intensity and exposure time.

Several elaborated expression of disinfection kinetic are developed later. It gave best results for the description of UV disinfection than Chick-Watson model.

The design of photo-reactor operating in continuous disinfection system, required tacking in account the hydrodynamic behavior of water in the reactor. Since the kinetic of disinfection depends on irradiation intensity distribution, coupling the hydrodynamic and solar radiation distribution is of crucial importance.

In this work we propose a numerical simulation study for hydrodynamic and solar irradiation distribution in a tubular photo-reactor. The radiative transfer equation (RTE) in conjunction with momentum conservation equations were solved using the CFD code

Fluent under the assumption of three-dimensional incompressible flow in unsteady turbulent regimes. The discrete ordinate model (OD) was used to simulate the light intensity distribution inside the reactor while Reynolds Averaged Navier-Stocks equations (RANS), the most widely used approach for calculating fluid flow field, were closed by one equation model namely Large Eddy Simulation.

The results of simulation concerned radiation, temperature, turbulence and velocity fields are discussed and the effect of inclination angle of reactor relative to the horizontal is investigated.

**Marek Stelmachowski**
Professor, Lodz University of Technology, Poland

# Photocatalytic Production of Hydrogen from Water Solution of Glycerol over the Tio2 Doped by Noble Metals

The increase of the production of biodiesel has resulted in a surplus of glycerin that has led to the essential market price drop. It indicates that the known processes and technologies used (up to now) for the glycerol utilization have many disadvantages and that the surplus of crude glycerol creates a barrier for the development of this industry branch. Utilization of (waste) glycerol is carried out by conversion of it into energy carriers (hydrogen, syngas and methane) or into other chemicals. In the last decade, the new - more advanced methods: the photocatalytic conversion of glycerol into hydrogen or the bio-conversion of it into other products has been tested in the laboratory scale to solve the problem. The review of the results presented in the literature indicates that the photocatalytic conversion of glycerol may become the most promising technology for the utilization of glycerol in the future from both an economic and environmental point of view. Glycerol can be converted into hydrogen in the presence of photocatalyst under mild conditions with solar irradiation as the source of renewable energy. The overall conversion reaction of glycerin is given by eq. (1) and possible simultaneous reaction of water splitting by eq. (2).

$$C_3H_8O_{3(liquid)} + 3H_2O_{(liquid)} \rightarrow 7H_{2(gas)} + 3CO_{2(gas)} \quad (1)$$

$$2H_2O_{(liquid)} \rightarrow 2H_{2(gas)} + O_{2(gas)} \quad (2)$$

The paper presents experimental results of photocatalytic conversion of glycerol and (probably) simultaneous splitting of water that were obtained in the test runs carried out with the use of the water solutions of glycerol, over TiO2 modified by Pt, Pd and other noble metals. The catalysts were obtained by the photodeposition method or the sol-gel method. The obtained hydrogen productivities are higher than the values of the productivity presented in the literature - both in the case the similar catalysts as well as for other catalysts.

The test runs were performed in the semi-batch reactor, which was equipped with four (or three) Xe-lamps as a light source. The highest hydrogen productivity (over 30 mmol $H_2 \cdot g_{cat}^{-1} \cdot h^{-1}$) was reached in the presence of $Pt/TiO_2$, when the glycerol concentration in the solution

was equal to 4,5 weight % and the concentration of the photocatalyst in the suspension was 0,042 weight %).

**Saif Uddin**
Research Scientist, Kuwait Institute for Scientific Research, Kuwait

# Radioactivity in Seawater – A Review from Northern Persian Gulf

The Gulf waters are extremely important to meet the freshwater needs in the region. There are large desalination facilities installed along the western Gulf coast, with a cumulative desalination capacity for the countries in the Arabian Gulf of approximately 11 $m^3$/d. Due to the fact that Gulf states are moving towards nuclear energy option, radioactivity monitoring becomes very important in the region. The first nuclear power plant in Bushehr, Iran, is operational since 2011 and others are commissioned in Abu Dhabi and Saudi Arabia. This study presents a first radionuclide baseline in the northern Gulf waters (considered as pre-nuclear) and is expected to be a valuable dataset for future monitoring work in this region. A average concentrations of tritium, strontium-90, polonium-210, lead-210, cesium-137, potassium-40, uranium-238 and uranium-234 in northern Gulf waters were 1.35 ± 0.09, 90.8 ± 0.18, 0.58 ± 0.18, 0.83 ± 0.11, 1.35 ± 0.1, 90.8 ± 2.8, 0.040 ± 0.005 and 0.054 ± 0.006 mBq/l respectively. The low levels of tritium in the region can be attributed to very limited atmospheric tritium fallout due to low precipitation and lack of NPP until 2011 in the area. The most likely source of strontium-90 concentration in Gulf waters is long-range transport. The concentrations of $^{210}$Po in seawater ranged between 0.48 and 0.68 mBq/l; however, there is a seasonal fluctuation that has also been observed. The $^{137}$Cs concentration in area is comparable to that reported for the Pacific and the Indian Oceans, i.e. between 0.1 and 2.8 mBq/l during the year 2000 (Povinec et al., 2005). The current baseline data generated suggest that the levels of these different radionuclides in Kuwait seawater are comparable to other marine waters in the northern hemisphere (IAEA, 2001). The low levels of radionuclide's ensures radiological safety of desalinated water and seafood.

**Fernando Valenzuela**
Head, Unit Operation and Hydrometallurgy Laboratory, Universidad de Chile, Chile

# Use of Modified Nano-Structured Silicates for Treatment of Highly Polluted Acidic Mine Drainages

This study addresses one major environmental problem concerning the management of liquids in mining countries like Chile: the natural generation of acidic mine drainages (AMD) through chemical and/or microbial oxidation of sulphides in presence of air and water. Acidic mine waters exhibit an important amount of chemical contaminants, either dissolved or suspended, at concentrations that normally surpass the limit fixed by the national discharge regulations which set the wastewaters quality so to be able to discard them into surface and groundwater bodies [1].

The general goal of this practical research was to study the application of novel sorption method to eliminate the inorganic contaminants existent in samples of highly polluted Chilean acidic mine drainages existing around copper ore deposits. We had prepared and used the sorbent nano-structured calcium silicate, n-$CaSiO_3$, in a former research, which had been successfully synthesized using a simple method based on reaction between sodium silicate and lime in a continuous reactor [2]. Now we have modified this sorbent in order to obtain a material that, keeping its huge surface area (> 300 $m^2/g$), presents improved characteristics to remove other contaminants from acidic aqueous solution. Partial replacement of Ca atoms of $CaSiO_3$ by iron, magnesium and aluminium atoms has generated very good sorbents for sorption of the following ionic species normally present in higher concentration in AMD: arsenate, arsenide, sulphate, phosphate, and some heavy metals, through the formation of insoluble granular double-salts or hydroxides. Removal of a high fraction of colloidal-particulate matter has been also achieved.

However, it is important to highlight that the scope of this research is not restricted to AMD case. Indeed, it can also be applied to any residual and natural aqueous solutions polluted with a high burden of ionic species generated in a wide ranges of mining and industrial activities.

**Marjorie Valix**
Lecturer, The University of Sydney, Australia
**Daniel Stoddart**
**&**
**Young Hong**
The University of Sydney, Australia

# Effect of Epoxy Depolymerisation in the Leaching of Copper from Electronic Waste

This study examined epoxy e-waste depolymerisation in sulphuric acid to its bisphenol monomer and its effect on removing dissolved copper by secondary reactions including adsorption and precipitation. E-wastes generally consist of 50-60% metallic fractions and 30% plastics. Various types of plastics are present in e-waste including high impact polystyrene (HIPS), polystyrene (PS), acrylonitrile-Butadiene-Styrene (ABS), polypropylene (PP), polyamide (PA), polyvinyl chloride (PVC), polycarbonates (PC), Polyethylene terephthalate (PET), polyurethanes (PU), polyphenylene oxide(PPO), polymethyl methacrylate (PMMA), and epoxy. The value of these fractions has driven the interest in recovering these materials, in particular the metallic fractions such as copper, rare earth and precious metals. Hydrometallurgical and bio-hydrometallurgical processing of e-wastes are subjected to variable metal recovery and of metal lost due to secondary reactions. In this study adsorption of dissolved copper on shredded waste epoxy (< 104 μm) was conducted under conditions that mimicked leaching in sulphuric acid at pH from 1.0 to 2.0, temperatures from 30°C to 90°C, pulp densities from 1g/ml% to 5 g/ml% for up 24 hours. The results showed that epoxy does partially depolymerise during leaching. Its effect was manifested by loss of copper by adsorption with increasing pulp density. At 1g/ml% pulp density and pH of 1.0, 43mg Cu/g of waste was lost by adsorption and this increased to 223 mg Cu/g of waste at 3 g/ml% pulp density. For a general electrical waste containing 15% copper, these metal adsorption represent 58 and 74.5 % metal loss respectively. Further increase in pulp density to 3 and 5 g/ml% did not lead to greater adsorption instead adsorption was reduced to 37 mg Cu/g of waste. This was attributed to poorer decomposition with the greater concentration of epoxy. Our results also showed that the adsorption was reversible. Optimum adsorption was achieved in 3-8 hours, there after 82-90% of the adsorbed copper was re-dissolved within 24 hours. It appears increasing the leaching temperature and reducing the pH contributed to the reversibility of copper adsorption. These results show that plastic decomposition can

affect the hydrometallurgical extraction of metals such as copper from e-waste. However its affect can be minimised by selecting appropriate leaching conditions.

**Nikolaos Voulvoulis**
Reader in Environmental Technology, Imperial College London, U.K.

# Pharmaceuticals in the Aquatic Environment: The Need for Catchment Management

The EU Water Framework Directive (WFD) aims to stabilise and enhance the chemical and biological status of water quality through phasing out and reducing priority pollutants. Even though pharmaceuticals are not currently considered as priority substances under the WFD, many pharmaceutical compounds are ubiquitous in environmental matrices and ecotoxicological data suggests that there are concerns for aquatic and terrestrial ecosystems. Catchment management plans based on accurate source assessment are therefore required for reducing source emissions should pharmaceuticals become priority pollutants in the future. Catchment level management uses geographical and hydrological boundaries as a framework for detailed assessment ofdiffuse and point source pollution. This paper focuses on emissions of human and veterinary pharmaceuticals from anthropogenic sources, at a catchment level, that require more holistic and integrated decision making to reduce environmental quality impacts. Typically, pharmaceuticals consumed by humans are excreted in urine and faeces as parent compounds or metabolites and enter the sewage system, reaching sewage treatment plants (STPs) where they are partially removed before being discharged into surface water. Therefore there is an increased need to improve the performance of municipal STPs in high density urban centres that discharge in sensitive catchments. As pharmaceuticals can reach the environment through waste disposal also, from a catchment management perspective, a holistic approach is more appropriate. For example the introductions of a medicine reuse scheme in primary care (most likely one which redistributes hormones) is recommended as a way to address pharmaceutical waste. However, significant advances in the control and verification of medicine quality are first required if reuse is to prove feasible, in practice, at a national level. Such an approach aims to help both industry and society to promote a better understanding of the environment at a local level and deliver positive and sustained outcomes for the water environment. Local collaboration and more transparent decision-making when both planning and delivering such activities will further facilitate this approach.

**Ying Wang**
Professor, Nanjing University, China
**Fei Kong**
MSc Student, Nanjing University, China
**Yong Guo**
Professor, Nanjing University, China
**Cheng Hai Ma**
Ph.D. Student, Nanjing University, China
**Jun Zhou**
Ph.D. Student, Nanjing University, China
&
**Zhi Gang Zhou**
Professor, Nanjing University, China

# Developing Efficient Polymeric Photocatalysts by Coupling Benzoic Acid Derivatives on Carbon Nitride Polymer

Since the shortage of global energy and environmental pollution, many endeavors have been devoted to find new energy to replace fossil energy. The energy from sun to earth in one hour is $4.3\times10^{20}$J, being more than all of the energy consumed by human being in one year (2001, $4.1 \times 10^{20}$ J).[1] Thus, utilizing solar energy to service human life has been the target of the scientsts around the world.[2] To date, many materials have been designed to harvest solar energy, mainly including inorganic materials(e.g.,titania-based systems, metaloxides, nitrides, sulfides, phosphides)[3] and organic metal complex(e.g. Ru-complex, Pt-complex).[4] Recently, Wang et al. reported that a polymer semiconductor of graphitic carbon nitride (g-$C_3N_4$) have photocatalytic activity.[5] Our goup also found that the activity of carbon nitride polymer can be largely increased by incorporatating anhydride group into its skeleton through amidation reaction of anhydride and $NH_2$ group in carbon nitride polymer.[6] The high photocatalytic activity may be due to the fact that the coupling anhydride groups is non-coplanar with the skeleton of carbon nitride polymer, which promotes the separation of the photoinduced electrons and holes. This means that chemical modification of carbon nitride polymer is a facile strategy to enhance its photocatalytic activity and understand the photocatalytic mechanism. Benzoic acid, anisic acid and p-nitrobenzoic acid have the samilar structure, but with different substituent groups. Herein, A series of polymeric photocatlysts were synthesized based on the reaction of carboxylic group and $NH_2$ groups in carbon nitride polymer with an attemp to understand the influence of substituent groups on the

photocatalytic performance.The experimental and theoretical calcalculation results show that the incorporated benzoic acid derivatives conjugate with the skeleton of carbon nitride polymer and electron-donating group is more favorable than that with electron-withdrawing groups to enhance the photocatalytic activity. The high photocatalytic activity can be due to the fact that the photoinduced holes are stabilized by the conjugated benzoic acid derivatives. This work provide a new insight for photocatalytic mechanism of carbon nitride polymer, which be helpful to develop high effective polymeric photocatalysts.

**Jian Hua Zhu**
Professor, Nanjing University, China
**Wei Gang Lin**
Ph.D. Student, Nanjing University, China
**Xiao Dan Sun**
MSc Student, Nanjing University, China
&
**Ying Wang**
Professor, Nanjing University, China

# Capturing the Tobacco-specific Nitrosamines (TSNA) in Environment

Cigarette smoke is harmful and addictive. No matter how often antismoking campaigns are shown, some people are painful to give up cigarette so that smoking is still a serious environmental problem in many countries, especially in China that is the largest country of cigarette production and consumption. Among 5200 compounds in tobacco smoke, tobacco-specific nitrosamines (TSNA) are strong carcinogens that have potential threat to the smokers and non-smokers who suffer from the environmental tobacco smoke. To control the smoking-caused pollution with zeolite and mesoporous silica, three strategies are tried. Firstly, these materials are directly put into the tobacco rod of cigarettes to *in situ* eliminate TSNA in smoke during the combustion of cigarette [1]. These additives will be activated when they are approached by the hot zone in burning cigarette, removing TSNAs once these carcinogens transfer or form in the smoke. Actually they can remove the TSNA up to 35% in the smoke of Burley type tobacco.

Secondly, different adsorbents including new mesoporous silica with hierarchical structure and rockery-like morphology are added into the filter trip of cigarette to remove the TSNA in smoke. Some new functional materials can selectively capture the TSNA in smoke, lowering the TSNA content about 30% [2]. Thirdly, liquid adsorption of TSNA in the tobacco extracting solution is studied with the monitoring of standard LC-MS/MS technique, in order to control the TSNA-caused pollution in source [3]. Various adsorbents, zeolite, mesoporous silica and activated carbon are utilized to trap nitrosamines in the extracting solution of Chinese-Virginia type tobacco with low TSNA content, and their performance was measured by LC-MS/MS methods [4]. The influence of pore size and cations of zeolite, modification of activated carbon were carefully investigated, and the optimal liquid conditions were determined, in which some zeolites and modified porous samples can capture the TSNA of 70% or more in the tobacco solution, offering

the efficient strategy for controlling the carcinogen like nitrosamines in environment.