Environment

Abstract Book
From the 6th Annual International Symposium on Environment
16-19 May 2011, Athens, Greece.
Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH
2011

First Published in Athens, Greece by the Athens Institute for Education and Research.

ISBN: 978-960-85411-8-4

8 Valaoritou Street
Kolonaki, 10671 Athens, Greece
www.atiner.gr

TABLE OF CONTENTS

(In Alphabetical Order by Author)

Preface

This abstract book includes all the abstracts of the papers presented at the ***6th Annual International Symposium on Environment, 16-19 May 2011***, organized by the Athens Institute for Education and Research. In total there were 78 papers and 84 presenters, coming from 31 different countries (Albania, Algeria, Belgium, Brazil, Bulgaria, Chile, China, Denmark, Egypt, Germany, India, Iran, Israel, Italy, Japan, Malaysia, Mexico, the Netherlands, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Korea, Sweden, Taiwan, Thailand, Turkey, the United Arab Emirates, the United Kingdom, and the United States of America). The conference was organized into 16 sessions that included areas such as Water Management & Treatment, Energy, Environmental Remediation, and Health. 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 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
Director

FINAL CONFERENCE PROGRAM

Athens Institute for Education and Research

Arts and Sciences Research Division
Environment and Agricultural Research Unit

6th Annual International Symposium on Environment, 16-19 May 2011 Athens, Greece

PROGRAM

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

Organization and Scientific Committee

1. Dr. Gregory T. Papanikos, President and Director, ATINER.
2. Dr. Theofilos Theophanides, Head, Environment & Agricultural Research Unit, ATINER & Professor, Department of Chemical Engineering, National Technical University of Athens, Greece.
3. Dr. Costas Stathopoulos, Deputy Head, Environment & Agricultural Research Unit, ATINER & Lecturer, University of Newcastle, Australia.
4. Dr. Eva Maleviti, Researcher, Environment & Agricultural Research Unit, ATINER.
5. Dr. Joanna Anastasopoulou, Professor, National Technical University of Athens, Greece.
6. Dr. Iakovos Caravanos, Professor, Hunter College of the City University of New York, USA.
7. Dr. Stevan Gressit, Medical Director, Office of Adult Mental Health, USA.
8. Dr. Nicholas Pappas, Professor, Sam Houston University, USA and Vice-President of Academics, ATINER.
9. Dr. Panagiotis Petratos, Head, Computer Research Unit, ATINER & Assistant Professor of Computer Information Systems, California State University, Stanislaus, USA.
10. Dr. Margarita Kefalaki, Researcher, ATINER.
11. Vasilis Skianis, Ph.D. Student, London School of Economics, U.K.
12. Ms. Lila Skountridaki, Researcher, ATINER & Ph.D. Student, University of Strathclyde, U.K.

Administration

Fani Balaska, Chantel Blanchette, Stavroula Kiritsi, Apostolos Kotsaspyrou, Eirini Lentzou, Konstantinos Manolidis, Katerina Maraki & Sylia Sakka

C O N F E R E N C E P R O G R A M

(The time for each session includes at least 10 minutes coffee break)

Monday 16 May 2011

08:30-09:30 Registration

09:30-10:00 Welcome and Opening Remarks

- Dr. Gregory T. Papanikos, Director, ATINER.
- Dr. Theofilos Theophanides, Head, Environment & Agricultural Research Unit, ATINER & Professor, Department of Chemical Engineering, National Technical University of Athens, Greece.

10:00-11:30 Session I: Energy and the Economy (ROOM A)
Chair: Papanikos, G.T., Director, ATINER

1. Singh, H., Professor, Grand Valley State University, USA. Full benefits of Green Energy Policy in Michigan.
2. Chow, T.T., Associate Professor, City University of Hong Kong, China & Dong, Z., MPhil Student, City University of Hong Kong, China. Energy Performance of Solar Water Heating Systems in Subtropical Hong Kong.
3. *Barbero, S., Researcher, Politecnico di Torino, Italy. Territorial Nets of Energy for Local Economic Development.
4. Diaz, M., Researcher, University of Chile, Chile. Energy Demand and Greenhouse Gas Emissions for Chile in 2030: Mitigation Options and Costs.
5. *Wildner, M., Student, Aarhus University, Denmark, Foged, B., Professor, Aarhus University, Denmark, Sorensen, M., Professor, Aarhus University, Denmark & Koch, C., Professor,Aarhus University, Denmark. Cleantech Niche Development.

11:30-13:00 Session II: Water Management & Water Treatment I (ROOM A) **Chair:** Maleviti, E., Researcher, Environment & Agricultural Research Unit, ATINER.	**11:30-13:00 Session III: Health I (ROOM B)** **Chair:** *Barbero, S., Researcher, Politecnico di Torino, Italy.
1. Clark, J., Professor, University of California, USA. Investigation of Groundwater Flow Variations near a Spreading Pond with Repeat Deliberate Tracer Experiments. 2. Avisar, D., Professor, Tel Aviv University, Israel. The Occurence of Oxytetracycline (OTC) in Local Groundwater Beneath Fish Pond. 3. Franca, A., Associate Professor, University Federal of Minas Gerais, Brazil & Oliveira, L., Associate Professor, University Federal of Minas Gerais, Brazil. Development of an Adsorbent Based on Spent Coffee Grounds for Wastewater Treatment - 1: Batch Adsorption Studies. 4. Oliveira, L., Associate Professor, Federal University of Minas Gerais, Brazil, Franca, A., Associate Professor, Federal University of Minas Gerais, Brazil & Oliveira Silva, L.C., Associate Professor, Federal University of Minas Gerais, Brazil. Development of an Adsorbent Based on Spent Coffee Grounds for Wastewater Treatment – 2: Fixed-bed Adsorption Studies. 5. Parkhomchuk, E., Researcher, Boreskov Institute of Catalysis, Russia. AOP's in Water Purification from Low and High Molecular Organic Contaminants. 6. Hu, B., Assistant Professor, Central University of Finance and Economics, China & McKitrick, R., Central University of Finance and Economics, China. Climatic Variations and the Market Value of Insurance Firms.	1. Felzenszwalb, I., Associate Professor, State University of Rio de Janeiro, Brazil. Evaluation of Urban Airborne Particulate Matter (PM2.5) in the City of Rio de Janeiro (Brazil) By Mutagenicity Assays. 2. Giri, A.K., Deputy Director, Indian Institute of Chemical Biology, India. Arsenic Induced Health Effects and Genetic Damage: Role of Climate Change in Arsenic Contamination in Ground Water. 3. Thannimalay, L., Lecturer, University of Malaya, Malaysia, Yusoff, S., University of Malaya, Malaysia & Soon, C.S., SIRIM, Malaysia. Global Harmonisation of Classification and Labelling of Mixtures and Consumer Product in Malaysia.

13:00-14:00 Lunch

14:00-15:30 Session IV: Water Management & Water Treatment II (ROOM A) **Chair:** Clark, J., Professor, University of California, USA.	**14:00-15:30 Session V: Environmental Remediation I (ROOM B)** Chair: Skianis, V., Ph.D. Student, London School of Economics, U.K.
1. Khoo, B.C., Professor, National University of Singapore, Singapore. Preliminary Numerical Study on the Understanding of Flow Pattern in a Potable Water Service Reservoir for Actual Service Condition. 2. Pazi, I., Professor, Dokuz Eydul University, Turkey, Yuccl-Gier, G., Professor, Dokuz Eydul University, Turkey, Kucuksezgin, F., Professor, Dokuz Eydul University, Turkey & Kocak, F., Professor, Dokuz Eydul University, Turkey. Investigation of TRIX in the Regulation of the Turkish Marine Aquaculture: Application to the Eastern Aegean Coastal Water (Izmir Bay). 3. Abrosimova, I., Ph.D. Student, Kazan Federal University, Russia. Research of Water-Bearing Horizons by Geothermal Methods. 4. Singha, S., Researcher, Jadavpur University, India. Modeling Radial Diffusion in a Fixed Bed Column: Adsorption of Hexavalent Chromium from Waste Water by Activated Carbon.	1. Mok, Y.S., Professor, Jeju National University, South Korea & Jwa, E., Jeju National University, South Korea. Effect of Nickel Loading and Support Material on Plasma-Catalytic Methanation of CO over Nickel Supported Catalysts. 2. Chen, Y.H., Assistant Professor, National Cheng Kung University, Taiwan. Synthetic Procedure Dependent on Cu (II) Adsorption Activity of Batio3 Nanoparticles. 3. Smets, K., Ph.D. Student, Hasselt University, Belgium, Carleer R., Hasselt University, Belgium, Yperman J., Hasselt University, Belgium. Flash Pyrolysis of Several Different Agricultural Press Cakes: Influence of Temperature on the Yield and the Characteristics of the Pyrolysis Oil. 4. Kunnummal, N., Engineering Consultant, Saudi Aramco, Saudi Arabia, Fageeha, O.I., Saudi Aramco, Saudi Arabia, Al-Ghamdi, S., Saudi Aramco, Saudi Arabia, Basfar, A.A., King Abdulaziz City of Science and Technology, Saudi Arabia, Chmielewski, A.G., Institute of Nuclear Chemistry and Technology, Poland, Pawelec, A., Institute of Nuclear Chemistry and Technology, Poland, Tyminski, B., Institute of Nuclear Chemistry and Technology, Poland, Zimek, Z., Institute of Nuclear Chemistry and Technology, Poland& Licki, J., Institute of Atomic Energy, Poland. Electron Beam Flue Gas Treatment (EBFGT) Technology for Simultaneous Removal of SO2 and NOx from Combustion of Liquid Fuels. 5. Lin, C.C., Student, National Cheng Kung University, Taiwan & Chen, Y.H., National Cheng Kung University, Taiwan. Synthesis, Characterization and Photocatalysis of Iron Oxide Nanotubes. 6. Tu, K.J., Student, National Cheng-Kung University, Taiwan & Chen, Y.H., National Cheng-Kung University, Taiwan. Synthesis and Photocatalysis of Hematite Thin Films Fabricated by RF Magnetron Sputtering Deposition.

15:30-17:00 Session VI: Earth & Soil I (ROOM A) **Chair:** Khoo, B.C., Professor, National University of Singapore, Singapore.	**15:30-17:00 Session VII: Energy I (ROOM B)** **Chair:** Zorer Gedik, G., Professor, Yildiz Technical University, Turkey.
1. Al-Sayah, M., Assistant Professor, American University of Sharjah, Sharjah, United Arab Emirates & Alyazouri, A., American University of Sharjah, Sharjah, United Arab Emirates, Humphreys, P., American University of Sharjah, Sharjah, United Arab Emirates, Jewsbury, R., American University of Sharjah, Sharjah, United Arab Emirates & Hassan, T.,American University of Sharjah, Sharjah, United Arab Emirates. Investigations into the Phytoextraction of Cr (VI) from UAE Polluted Soil Using Native Desert Plants. 2. Gupta, R., Senior Research Fellow, University of Delhi South Campus, India, Mehta, G., University of Delhi South Campus, India, Pal Khasa, Y., University of Delhi South Campus, India & Chander Kuhad, R., University of Delhi South Campus, India. Production of Ethanol, the Second Generation Biofuel, From Corncob, an Agricultural Residue. 3. Brown, J., Postdoctoral Fellow, Gothenburg University, Sweden. Metabolomic Profiling and P-Glycoprotein Activity Assay Show Altered Physiology of Earthworms Exposed to Dairy Shed Effluent. 4. Laiou, A., Ph.D. Student, University of Tuscia, Italy. Geographical and Seasonal Variation of Taxol Content in the Needles of *Taxus Baccata L.* estimated by High Pressure Liquid Chromatography (HPLC). 5. Stals, M., Ph.D. Student, Hasselt University, Belgium. Activation and Characterization of Pyrolysis Chars from Short Rotation Hardwoods.	1. *Anderson, N., Professor, University of Minnesota, USA. Risk Assessment of Sustainable Glasshouse Energy Alternatives for Northern Latitudes. 2. Maintinguer, S., Ph.D., University of Sao Paulo, Brazil, Lazaro, C.Z., Ph.D Student, University of Sao Paulo, Brazil, Sakamoto, I.K., Ph.D, University of Sao Paulo, Brazil and Varesche, M.B.A., Professor , University of Sao Paulo, Brazil. Hydrogen Biologic Production from Environmental Sample in Tropical Countries. 3. Hisschemoller, M., Associate Professor, University of Amsterdam, The Netherlands & Sioziou, I., University of Amsterdam, The Netherlands. Boundary Organizations for Resource Mobilization Enhancing Citizens Involvement in the Dutch Energy Transition. 4. Rojano A., Professor, Universidad Autónoma Chapingo, Mexico. Phase Diagrams in Agricultural Engineering. 5. Pizarro Lopes, G., Master Student, University of Porto, Portugal. Modelling Viscosity of Raw Materials for Biodiesel Production. 6. Ratti Sartori, R.P., Professor, University of Sao Paulo, Brazil, Botta, L.S., Professor, University of Sao Paulo, Brazil, Sakamoto, I.K., Professor, University of Sao Paulo, Brazil, Maintinguer, S.I., Professor, University of Sao Paulo, Brazil, Lazaro, C.Z., Professor, University of Sao Paulo, Brazil & Varesche, M.B.A., Professor, University of Sao Paulo, Brazil. Comparison of Different Pretreatment Methods for Enriching Hydrogen Producing Bacteria from Cellulose Digestion by Ruminal Fluid Microflora.

17:00-19:00 Session VIII: Built Environment & Energy Use (ROOM A) **Chair:** *Anderson, N., Professor, University of Minnesota, USA.	**17:00-19:00 Session IX: Waste Management & Industrial Cases (ROOM B)** **Chair:** *Santos, P., Professor, Campinas Anhanguera Faculty, Brazil.
1. Coelhan, M., Professor, Technische Universität München, Germany, Hilger, B., PhD Student, Bavarian Health and Food Safety Authority, Germany, Fromme, H., Professor, Bavarian Health and Food Safety Authority, Germany & Völkel, W., Professor, Bavarian Health and Food Safety Authority, Germany. Determination of Chlorinated Parafffins in House Dust Samples. 2. Zorer Gedik, G., Professor, Yildiz Technical University, Turkey, Unver, R., Professor, Yildiz Technical University, Turkey, Sakinc, E., Research Assistant, Yildiz Technical University, Turkey. Building Envelope Design in Terms of Visual and Thermal Comfort in Offices. 3. Lee, J.H., Professor, Chungnam National University, Korea. Characteristics of Trace Elements in Indoor PM2.5 at a Subway Station in Korea. 4. Erdem Aknesil, A., Associate Professor, Beykent University, Turkey & Nese Yugruk, A., Associate Professor, Beykent University, Turkey. Legal Regulations Governing Noise Control in Turkey and Examples of Environmental Noise Determination Studies in Istanbul. 5. Blizzard, J., NSF Graduate Research Fellow, Clemson University, USA. A Whole-Systems Approach for Designing Sustainable Infrastructure. 6. Martin-Dominguez, I.R., Researcher, Advanced Materials Research Center, Mexico, Alarcon Herrera, M.T., Researcher, Advanced Materials Research Center, Mexico, Burciaga-Santos, J.A., Researcher, Advanced Materials Research Center, Mexico & Castro-Lopez, P.E., Researcher, Advanced Materials Research Center, Mexico. Trnsys Simulation and Optimization of a Solar-Thermal Collection and Storage System for the Heating of Agricultural Greenhouses.	1. *Foltynowicz, Z., Professor, Poznań University of Economics, Poland, Forsgren, C. Technical Director, Stena Metall AB, Sweden & Pettersson, C.,Ph.D., Stena Metall AB, Sweden. Food Waste Treatment on Ships by Microwave Drying. 2. Kim, M.S., Principal Researcher, Korea Institute of Energy Research, Korea & Dong-Hoon, K., Principal Researcher, Korea Institute of Energy Research, Korea. Optimization of various Culture Conditions for Photo- Fermentative Hydrogen and Fatty Acids Production by Purple Non-Sulfur Bactrerium, Rhodobacter Sphaeroides. 3. Han, S.H., Researcher, Korea Advanced Institute of Science and Technology, Korea & Chang, D., Researcher, Korea Advanced Institute of Science and Technology, Korea. Slab Residence Time Effect to the Efficiency of a Reheating Furnace for Steel Mill Company. 4. Joshi, K. S., M. Tech Student, Indian Institute of Technology Bombay, Mumbai, India. Performance and Emissions Analysis of Compression Ignition Engine Fuelled with Jatropha and Karanja Oils. 5. Bingol, D., Ph.D., Kocaeli University, Turkey & Karayunlu Bozbas, S., Ph.D., Kocaeli University, Turkey. Optimization of Dry Mechanochemical Conversion Conditions of SrSO4 to SrCO3.

20:30-22:30 Greek Night and Dinner

Tuesday 17 May 2011

8:00-9:30 Session X: Energy II (ROOM A)
Chair: Kunnummal, N., Engineering Consultant, Saudi Aramco, Saudi Arabia.

1. Rezende, D., Student, Campinas Anhanguera Faculty, Brazil, *Santos, P., Professor, Campinas Anhanguera Faculty, Brazil & Mariotoni, C., Professor, Campinas Anhanguera Faculty, Brazil. Highlights of the Studies for the Use of Landfills for Power Generation in Brazil.
2. Park, S.Y., Ph.D. Student, Korea University, Republic of Korea. Measuring the Conservation Value of Tidal Flat in Shinan, Korea: A Contingent Valuation Study.
3. Svang-Ariyaskul, A., Lecturer, Thammasat University, Thailand. Optimization of Biodiesel Production using Reactive Separation Process. (Tuesday, 17th of May, 2011)
4. Al Jallad, F., Researcher, National Energy and Water Research Center, UAE, Al Omar, M., National Energy and Water Research Center, UAE, Al Yalyali, S., National Energy and Water Research Center, UAE & Al Katheeri, E., National Energy and Water Research Center, UAE. Electromagnetic Fields generated by Power Transmission Lines in Abu Dhabi Emirate-UAE.
5. Velghe, I., Ph.D. Student, Hasselt University, Belgium, Carleer R., Hasselt University, Belgium, Yperman J., Hasselt University, Belgium & Schreurs S., Department TIW, XIOS., Belgium. Study of the Pyrolysis of Municipal Solid Waste for the Production of Renewable Fuels and Chemicals.
6. Lazaro, CZ. Ph.D. Student, University of Sao Paolo, Brazil. Fermentative Hydrogen Production Using Vinasse as Subtrate.

9:30-11:00 Session XI: Water Management & Treatment III (ROOM A) **Chair:** *Dawoud, M., Manager, Water Resources Department, Environment Agency, United Arab Emirates.	**09:30-11:00 Session XII: Environmental Remediation II (ROOM B)** **Chair:** *Foltynowicz, Z., Professor, Poznań University of Economics, Poland
1. Salazar, R., Professor, Universidad Autónoma Chapingo, Mexico, Szidarovszky, F., Systems and Industrial Engineering Department, University of Arizona, Tucson, U.S.A, Zatarain, J., Cologne University of Applied Sciences, Cologne Germany & Rojano, A., Universidad Autónoma Chapingo, Mexico. Optimal Water Distribution Scenarios Using Two Approaches. 2. Kucuksezgin, F., Professor, Dokuz Eylul University, Turkey. Evaluation of Organochlorine Pesticide Residues in Sediments from Gediz and Bakırçay Rivers, Eastern Aegean. 3. *Salem, I., Professor, Tanta University, Egypt, Zaki, A.B., Tanta University, Egypt, Gemeay, A.H., Tanta University, Egypt & Elgharabawy, G.R. Tanta University, Egypt. The Role of Polyaniline/Silica-Alumina Composites in the Decolorization of Some Organic Pollutants. A Model for Waste Water Treatment 4. Das, S., Assistant Professor, Charuchandra College, India. Concurrent Biosorption and Biotransformation of Hexavalent Chromium by Immobilized Aspergillus Flavus Strain Isolated From Tannery Wastewater.	1. Chang, J., Professor, South China University of Technology, China, Wang J., South China University of Technology, China &Fan, J., South China University of Technology, China. Catalytic Upgrading of Bio-oil Over Ion Exchange Resin Catalysts. 2. Adjroud, O., Lecturer, Batna University, Algeria. Protective Effects of Selenium against Nickel Chloride -Induced Nephrotoxicity in Preimplanted Rats. 3. Moraes, B., Ph.D. Student, University of Sao Paulo, Brazil. Intrinsic Kinetics of Autotrophic Denitrification using Sulfide as Electron Donor in Systems with Immobilized Biomass. 4. Kirin, T., Ph.D. Student, Università della Tuscia, Italy, Tomasino, M.P., Università della Tuscia, Italy, Simeone, M.C., Università della Tuscia, Italy, Bogdanović, S., University of Zagreb, Croatia & Schirone, B., Università della Tuscia, Italy. Inula verbascifolia – Biogeographic Inferences on a Mediterranean Endemic Medicinal Plant. 5. Sarrafzadeh, M.H., Professor, University of Tehran, Iran. An Inquiry on the Environmental Aspects of Oil Contamination of Soil and Groundwater by Industry: Surveying and Cleaning Methods.

11:00-12:30 Session XIII: Life Cycle Assessment–Product Eco-Design (ROOM A) **Chair:** Salazar, R., Professor, Universidad Autónoma Chapingo, Mexico	**11:00-12:30 Session XIV: Health II (ROOM B)** **Chair:** Chang, J., Professor, South China University of Technology, China
1. Plumblee, J.M., NSF Graduate Research Fellow, Clemson University, USA. Integrating Disaster Risk into the Life-Cycle Assessment Framework. 2. *Coku, A., Biologist, University of Tirana, Albania, Lika, M., University of Tirana, Albania & Bani, R., University of Tirana, Albania. Microbiological Quality of Minimally Processed Vegetables Sold in Tirana, Albania. 3. Allione, C., Researcher, Politecnico di Torino, Italy & De Giorgi, C., Researcher in Industrial Design, Politecnico di Torino, Italy Lerma, B., Researcher, Politecnico di Torino, Italy,. Ecocompatibility_Materials_Project. Approach for Materials Selection in Order to Pursue the Eco-Compatibility of the Product Life Cycle. 4. De Giorgi, C., Researcher in Industrial Design, Politecnico di Torino, Italy, Lerma, B., Researcher Politecnico di Torino, Italy, Allione, C., Researcher Politecnico di Torino, Italy Design and Product Eco-compatibility perception of the materials.	1. Ziarati, P., Head of Biological chemistry Department & Dean of Education in Advanced Sciences & Technologies Islamic Azad University - Pharmaceutical Sciences Branch, Tehran, Iran. Contamination of Cadmium and Lead on Iranian Jujube. 2. Ismail, A., Ph.D. Student, Imperial College London, U.K. , Archer, S., Imperial College London, UK & Bates J., Imperial College London, UK. Effects of Atmospheric Pollutants on the Distribution of Epiphytic Terrestrial Algae along Pollutant Gradient of London Transect. 3. Takuchev, N., Lecturer, Trakia University, Bulgaria. Study of the Urban Air Pollution Over Stara Zagora, Bulgaria with a Mobile Automatic Station.

12:30-13:30 Lunch

13:30-15:00 Session XV: Water Management & Treatment IV (ROOM A)
Chair: Khan, S., Associate Professor, Duquesne University, USA,

1. Xu, Y., Associate Professor, Chinese Academy of Sciences, China, Qiao, M., Chinese Academy of Sciences, China, Zhou, Y., Chinese Academy of Sciences, China & Wang, Z., Chinese Academy of Sciences, China. Occurrence and Removal of Organic Micropollutants in Advanced Treatment Processes of Wastewater.
2. *Dawoud, M., Manager, Water Resources Department, Environment Agency, United Arab Emirates. Treated Wastewater Management and Reuse in Arid Regions: Abu Dhabi Case Study.
3. *Alarcon Herrera, M.T., Researcher, Advanced Materials Research Center, Mexico, Olmos-Marquez, M.A., Advanced Materials Research Center, Mexico & Martin-Dominguez, I.R., Advanced Materials Research Center, Mexico. Constructed Wetlands: An Alternative to Remove Arsenic from Water in Rural Communities.
4. Maazallahi, H., BSc Student, Sharif University of Technology, Iran, Zolfaghari, M., M.SC. Student, Sharif University of Technology, Iran, Vosoughi, M., Professor, Sharif University of Technology, Iran & Alemzahdeh, I., Professor, Sharif University of Technology, Iran. Oily Wastewater Treatment by a Novel Fixed-Film Baffled Bioreactor.
5. Kolahchi, N., Ph.D. Student, Islamic Azad University Iran. Eco-Hydrology Concept in Arid and Semi-Arid Range Land.

15:00-16:30 Session XVI: Environmental Remediation III (ROOM A)
Chair: *Santos, P., Professor, Campinas Anhanguera Faculty, Brazil.

1. Khan, S., Associate Professor, Duquesne University, USA, Gray, M.L., Associate Professor, Duquesne University, USA, Bultrus, J., Associate Professor, Duquesne University, USA & Araujo, I., Associate Professor, Duquesne University, USA. A Unique Nanocrystalline Photo-Release Sorbent for the Capture and Sequestration of Carbon Dioxide from Air and Flue Gases.
2. Ahn., H., Senior Research Scientist, Korea Research Institute of Chemical Technology, Korea, Kang, H.C., Principal Research Scientist, Korea Research Institute of Chemical Technology, Korea, Kim, J.H., Principal Research Scientist, Korea Research Institute of Chemical Technology, Korea & Kim, B.S., Principal Research Scientist, Korea Research Institute of Chemical Technology, Korea. Vacuum Regeneration of CO2 from Amine Solution using Porous PTFE Membrane.
3. Ozdemir, G., Associate Professor, Ege University, Turkey & Kocaturk, S., Chemical Engineer, Turkey. Removal of Heavy Metal Ions from Aqueous Solutions Using Modified Chicken Feathers.
4. Aktas, T.S., Ph.D. Student, Tohoku University, Japan. Comparison of Zeta Potential and Coagulation Behaviors of Different Cyanobacteria and Algae.
5. Kim, J.H., Principal Investigator, Korea Research Institute of Chemical Technology, South Korea. Development of PES Hollow Fiber Membranes and Process for the Separation of CO2/CH4 Mixture in Landfill Site.

17:00-20:00 Urban Walk

20:00-21:00 Dinner

Wednesday 18 May 2011

Cruise: Departure at 07:00 Estimated Return Time: 20:30

Thursday 19 May 2011

Delphi Visit: Departure at 08:10 Estimated Return Time: 19:30

Irina Abrosimova
Ph.D. Student, Kazan Federal University, Russia.

Research of Water-Bearing Horizons by Geothermal Methods

Heterogeneity of the temperature field, observed in the upper layers of sedimentary sequence (down to a depth of 1000 m), is defined by the action of different components: varying deep heat flow from the interior, structure (relief), latitude effect of solar radiation, lithofacies characteristics of the geological section (thermal capacity of rocks), and, mainly, hydrogeological factor.

Hydrogeological factor is related to the mass transfer, which is controlled by variations of the convective heat-flow within the upper sedimentary strata. Variations of the convective heat flow, which reflect local and regional influence of the underground water migration on the vertical component of the accumulative heat flow, were studied for the Precaucasus and Volga-Ural regions. The variations of the convection heat-flow reaching 25 mW/m^2 to 30 mW/m^2 within the upper sedimentary strata.

Large, low-temperature zones in the center of Volga-Ural province is produced by cold infiltration waters. The lowest temperature has been recorded in the areas with the deepest level of underground water. The upper sedimentary cover, particularly in the central portions of the arches, is affected by the intensive infiltration of surface waters cooling the rocks and producing local temperature minima. High-temperature zones have been detected on large troughs (Precaspian depression). Almost all of them are buried zones of underground water discharge producing temperature and thermogradient maxima in the thermal field.

By use of the geothermal observation, we determined hydrogeological characteristics (local aquifuges, borders of zones of active water exchange, infiltration and discharge zones, filtration rate of underground waters and other parameters). This information can be used to control pollution of the underground waters, for example, due to aquifuges failure of lower Permian sediments hydrogen-sulfide waters can surface as spring on certain studied areas.

Ounassa Adjroud
Lecturer, Batna University, Algeria.

Protective Effects of Selenium against Nickel Chloride-Induced Neprotoxicity in Preimplanted Rats

The environmental exposure to nickel may have a disastrous impact on human and animal public health. In this study we evaluated the protective effects of selenium against the nephrotoxic effects of $NiCl_2$ in the preimplanted rats.

$NiCl_2$ was given on day 3 of pregnancy either as a single subcutaneous (sc) dose of 25, 50 or 100 mg/kg or in distilled drinking water at a dose of 20 mg/L/day for 16 consecutive days. Selenium was given as a sc injection (0.3 mg/kg) together with the higher dose (100 mg/kg) of $NiCl_2$. Changes in plasma creatinine and urea were measured in treated and control groups on days 5 and 20 of gestation. The results showed that 100 mg / kg $NiCl_2$ sc induced a significant increase in plasma creatinine on day 5 of gestation compared with controls. In contrast, on day 20 of gestation the $NiCl_2$ induced a significant decrease in creatinine induced by doses of 25 and 50 mg / kg, whereas dose of 100 mg / kg increased plasma creatinine. Co-administration of selenium with $NiCl_2$ significantly improved plasma creatinine on 5 and 20 days of gestation compared with $NiCl_2$ administered alone. Moreover, on day 5 of gestation the $NiCl_2$ increased significantly plasma concentrations of urea with the low and medium doses which became very significant with the highest dose. On day 20 of gestation, 50 mg / kg $NiCl_2$ induced a significant decrease in plasma urea while the dose of 100 mg / kg induced an increase. Coadministration of selenium did not improve the concentrations of urea induced by $NiCl_2$ alone. The $NiCl_2$ administered in drinking water had no effect on plasma creatinine and urea. 3 doses of $NiCl_2$ (sc) induced an alteration of renal architecture which is markedly improved by Selenium. The $NiCl_2$ taken orally affects the medulla. These results suggested that selenium had no effect against nephrotoxicity induced by $NiCl_2$ administered subcutaneously in pregnant rats.

Hyoseong Ahn
Senior Research Scientist, Korea Research Institute of Chemical Technology, Korea.
Jeong-Hoon Kim
Principal Research Scientist, Korea Research Institute of Chemical Technology, Korea.
Ho-Cheol Kang
Principal Research Scientist, Korea Research Institute of Chemical Technology, Korea.
Beom Sik Kim
Principal Research Scientist, Korea Research Institute of Chemical Technology, Korea.

Vacuum Regeneration of CO2 from Amine Solution Using Porous PTFE Membrane

CO_2 emission from the combustion of fossil fuels in conventional power plants is recognized as a main source of global climate change. Amine absorption process is commonly accepted as the most viable CO_2 capture process because of low separation cost and large scale applicability. But, it still needs some improvement to reduce its operating cost. In amine process, high temperature distillation process is being applied for CO_2 desorption and is known as the most high energy consuming step and responsible for more than 80% of main operational cost. Korea Research Institute of Chemical Technology (KRICT) has carried out the membrane process for the reduction of stripping energy in amine absorption process for carbon dioxide separation in power plant. The membranes used for stripping were plat PTFE (Polytetrafluoroethylene, Teflon) porous membranes. The effects of amine absorbents (MEA, DEA and TEA), CO_2 loading and feed temperature on the recovery of CO_2 were investigated at different vacuum stripping pressure. CO_2/N_2 mixture containing 10-30 vol. % of CO_2 was used as model gases for this study.

Tugrul Selami Aktas
Ph.D. Student, Tohoku University, Japan.
Fumihiko Takeda
Ph.D. Student, Tohoku University, Japan.
Chikako Maruo
Ph.D. Student, Tohoku University, Japan.
Osamu Nishimura
Ph.D. Student, Tohoku University, Japan.

Comparison of Zeta Potential and Coagulation Behaviors of Different Cyanobacteria and Algea

The aim of this study was to compare the zeta potential and coagulation behaviors of different cyanobacteria and algae species. For this purpose *Synechococcus* sp. (in size 0.2-2µm) and *Microcystis aeruginosa* (in size 2-5µm), common cyanobacteria strains and *Chlorella vulgaris* (in size 3-10µm), a green algae strain were cultivated in the laboratory conditions using CB and C medium, respectively.

Coagulation experiments conducted with polyaluminium chloride (PACl). Throughout the coagulation experiments the zeta potential and turbidity changes of cyanobacteria and algae were observed. The results showed that the zeta potentials of *Synechococcus* sp. and *M. aeruginosa* were positive at acidic condition, with a maximum of +12.16 and +31.3 mV at a pH of 5.0 ± 0.1, respectively. These results showed differ from previous study that such cyananobacteria have the negative zeta potential at pH 5 (R.Henderson, 2010 and R. Martinez, 2008). Additionally, the zeta potential of *C. vulgaris* was negative at both acidic and alkaline conditions, with a maximum of -30.36 mV at pH 10. Increasing in coagulant dose significantly affects neutralizing the charge of *M. aeruginosa,* however there is almost no affect neutralizing the charge of *Synechococcus* sp. and *C. vulgaris*. As a result of this, turbidity was relatively treatable with maximum removal efficiency of 95%, 4% and 16% for *M. aeruginosa*, *Synechococcus* sp. and *C. vulgaris* with 30 mg/l PACl and zeta potential values of -8.55, -28.48 and -25.48 mV at pH 7, respectively. These results indicated that each species has different coagulation ability and it may be caused by the differences in surface properties and high molecular weight proteins of *M. aeruginosa*. This is supported by previous study that (R.Henderson, 2010). *M. aeruginosa* was the most reactive with PACl than that other cyanobacteria species *Synechococcus* sp. and algae species *C. vulgaris.*

Fadi Al Jallad
Researcher, National Energy and Water Research Center, UAE.
Muthanna Al Omar
National Energy and Water Research Center, UAE.
Said Al Yalyali
National Energy and Water Research Center, UAE.
Entisar Al Katheeri
National Energy and Water Research Center, UAE.

Electromagnetic Fields Generated by Power Transmission Lines in Abu Dhabi Emirate-UAE

Power transmission lines had recently became a source of distress among people due to public awareness regarding the emission of electromagnetic radiation and their link to certain health effects. Power Lines are known to emit electric and magnetic fields of extremely low frequency. Recently, many scientists decided that continuous exposure to levels of magnetic fields higher than 0.4 microtesla (μT) are linked to Childhood Leukemia, whereas 1.2 μT has been associated with human breast cancer cells in vitro and higher levels of 1.6 μT may be associated with spontaneous abortions. On the contrary, electric fields are considered non-hazardous.

This research work was done to measure the strength of electric and magnetic fields in Abu Dhabi Emirate during 2010, using electric and magnetic field analyzers. Measurements were done under 400, 220 and 132 kV power lines as the hot spots and in different communities and natural ecosystems to represent the background levels.

Measurements showed that the highest values for electric fields strengths were found to be 7.41±3.94 $kV.m^{-1}$, 5.454±2.691 $kV.m^{-1}$ and 2.769 $kV.m^{-1}$ for 400, 220, and 132 kV power lines respectively, whereas the highest magnetic flux density were 2.456±1.226 μT, 2.223 ± 2.036 and 0.216 μT for the three types of power lines. EMFs in residential areas showed electric field strength to be 25.64±62.99 $V.m^{-1}$ and magnetic average flux density was 30.49±23.96 nT, both average values were considerably low. The background measurements in natural ecosystems showed an average electric field strength of 2.12±2.623 $V.m^{-1}$ and magnetic flux density of 1.194±1.183 nT.

Levels reported both in residential area and natural ecosystems were far below the guideline values of international organizations also they were below the limit of childhood leukemia which is 0.4 μT.

Mohammad Al-Sayah
Assistant Professor, American University of Sharjah, Sharjah, UAE.
Ayman Alyazouri
American University of Sharjah, Sharjah, UAE.
Roger Jewsbury
American University of Sharjah, Sharjah, UAE.
Paul Humphreys
American University of Sharjah, Sharjah, UAE.
Hassan Tayin
American University of Sharjah, Sharjah, UAE.

Investigations into the Phytoextraction of Cr (VI) from UAE Polluted Soil Using Native Desert Plants

Soil pollution by hazardous substances that could be attached to the particles of soil or trapped within them is generally caused by industrial waste such as petroleum hydrocarbons, pesticides, chemical solvents, heavy metals and radionuclides. Sometimes soil contamination can occur naturally because of the existence of natural ores of some heavy metals such as lead, cadmium, mercury and chromium.

Contaminated soils can be remediated using physical, chemical, or biological techniques. Phytoremediation is another technique used to remediate soil or water pollutants using plants. The plant is used to extract heavy metal pollutants from the soil by the roots and then it translocates and accumulates them in the above-ground parts of plant, such as shoots, leaves and stems; the process is called phytoextraction. The plant is then harvested and disposed in a safe and contained environment.

In this paper, we present the results of a study conducted in UAE to use native desert plants for phytoextraction of heavy metals from desert soil. Twelve suspected polluted sites were investigated for contamination with eight heavy metals (zinc, lead, nickel, manganese, iron, copper, chromium, cobalt, and cadmium) and sixteen local plants from the UAE desert were evaluated for their ability to accumulate heavy metals. It was observed that the most problematic heavy metal in the main polluted sites is chromium with total chromium concentration of 1800 mg/kg and for hexavalent chromium 97 mg/kg in Ajman industrial zone. Besides, *Portulaca oleracea* has been shown to be the best candidate for Cr(VI) accumulation where more than 95% of the accumulated Cr(VI) was reduced to the less toxic Cr(III) within the plant. The uptake of Cr(VI) by this plant has been investigated under

different conditions and factors. The results of f these investigations will be presented and set of optimized factors will be recommended.

Maria Teresa Alarcon Herrera
Researcher, Advanced Materials Research Center, Mexico.
Mario A. Olmos-Marquez
Advanced Materials Research Center, Mexico.
Ignacio R. Martin-Dominguez
Advanced Materials Research Center, Mexico.

Constructed Wetlands: An Alternative to Remove Arsenic from Water in Rural Communities

Arsenic is a metalloid naturally present in many groundwater sources destined for human consumption, which entails a public health risk. In Mexico, reverse osmosis (RO) is the most popular arsenic removal process currently available. The greatest limitation of this process is the amount of water that the process rejects, which is in the order of 50%. This feature and the system's high operation costs make it expensive for many communities, especially those in rural areas; it is therefore necessary to find alternatives for efficient arsenic removal. Constructed wetlands have been considered as a possibility for As removal in previous studies done by our research group. The objective of the present study was to determine the feasibility of using this process for the treatment of the water with high arsenic content and water rejected by reverse osmosis systems.

The experiment was performed over a period of 3 months in a system consisting of three prototype Constructed wetland units, all operating with subsurface flow. The used support medium was lime sand. Two of the units (H1 and H2) were planted with *Eleocharis macrostachya* plants. The third unit was used as a control (H3), with a lime sand substrate but no plants. Two influx arsenic concentrations (0.1 and 0.4mg/L) and two retention times (2.3 and 1.0 d^{-1}) were used during the experiment.

Results indicate that constructed wetlands are able to retain an average of 90 to 95% of the arsenic present in feed water containing concentrations in the range of 0.01 to 0.4mg/L. Arsenic concentration in the feed water has a heavy influence on the system's operation efficiency; higher entry concentrations lead to higher arsenic removal efficiency. The removal efficiency of the wetland with no plants (control) was only 23% at the end of the experiment, which shows the importance of the plants in arsenic removal.

The system as a whole (soil + plants) was able to efficiently remove arsenic from water and even keep As concentrations in the treated water under 0.025mg/L (maximum value allowed for drinking water in Mexico (NOM-127-SSA-1994). Our results show that Constructed

wetlands have a high potential for reducing high arsenic concentrations in water. Because of this, they can be used both for arsenic removal as a pretreatment of drinking water and for the treatment of water rejected by reverse osmosis systems.

Christina Allione
Researcher, Politecnico di Torino, Italy.
Beatrice Lerma
Researcher, Politecnico di Torino, Italy.
Claudia De Giorgi
Researcher in Industrial Design, Politecnico di Torino, Italy.

Ecocompatibility Materials Project. Approach for Materials Selection in order to Pursue the Eco-Compatibility of the Product Life Cycle

On the awareness that the eco-compatibility of a product is made by the right choice of materials able to influence the life cycle performances of the product, the paper deals with a research study aimed at identifying environmental guidelines for material selection in order to pursue the eco-compatibility of the life cycle product.

This goal is derived from a main research carried out at DIPRADI-Industrial Design, which is focused to develop MATto, a virtual and physical library including more than 500 innovative materials' samples. The groundbreaking aspects of MATto is providing an analysis of the perceptual performances and eco-properties of the materials. Therefore the innovative materials of MATto could be compared with the traditional materials analysis provided by other well-know database (CES2009, etc.).

A study has been carried out and it is aimed at developing a list of ecodesign guidelines for the material selection from life cycle product's guidelines. These information are organized in 4 main strategies which are classified in a range of quantitative and qualitative eco-properties such as:

- use of resources with a low environmental impact : short distribution chain, low embodied energy, Co_2 footprint, number of manufacturing processes, toxicity for human health and at the materials end of life, renewable resources, reduced material intensiveness;
- material useful life extension: durability, end of life scenarios;
- environmental ethics and policies: material environmental declarations or strategies and policies adopted by materials' producers;
- material identity based on perceptive characteristics, came by sensory evaluations on materials and objective descriptions of the materials expression: brand, recognisability, multi-sensoriality.

The results collected so far into defining these material selection guidelines and eco-properties able to describe the eco-compatibility performances of life cycle materials included in MATto are described in this paper.

Neil Anderson
Professor, University of Minnesota, USA.

Risk Assessment of Sustainable Glasshouse Energy Alternatives for Northern Latitudes

Nearly 100% of glasshouse/nursery production is fossil-fuel based for heating/cooling (natural gas, propane, heating oil), electricity, glazing materials (rigid, flexible plastics), fertilizers, pesticides, mechanization, containers, and shipping. Glasshouse growers institute heat-saving mechanisms, however most energy sources are fossil fuel-derived (no large-scale commercial grower has 100% sustainable heating sources), placing the economic viability of the industry at high risk. Continued high costs and dwindling world oil, coal, natural gas reserves escalate pricing and availability. This is particularly acute for winter heating in northern latitudes; many have tried sustainable heating sources, only to find serious installation/maintenance issues, a lack of scientific research and guidelines to assess risk. As a result, many glasshouse growers have stopped using sustainable alternatives. Sustainable production is severely curtailed without risk assessment and best practices research on viable alternative energy-generating systems. The type(s) of sustainable systems in use for glasshouse heating or electricity generation are solar (active/passive systems; direct collection/storage; photovoltaic cells), wind (generators), waste heat (power plants), biogas (animal waste), compost (plant decomposition), biofuels (corn, native grasses), water reservoirs (aquaculture), wood, or geothermal (ground-source heat pumps). These systems were analyzed for growers in the Midwestern United States to identify pertinent economic issues (cost, payback, labor, efficiency, management) and risks incurred with their installment and continued use. Risk assessments of sustainable systems showed high initial purchase and installation costs, unexpected and costly hazards, maintenance issues, and increases in time/labor for routine operation of heat sources. While some costs could be offset by implementing new energy-saving mechanisms, such as low emitting diode (LED) lighting to replace energy consumptive high intensity discharge (HID) lights, the payback timeframe is lengthy. Before widespread implementation of sustainable energy systems can be economically viable, considerable glasshouse research is required to analyze which system(s) would be the most effective across a range of northern latitudes.

Dror Avisar
Professor, Tel Aviv University, Israel.
Gilli Levin
Tel Aviv University, Israel.
Igal Gpzlan
Tel Aviv University, Israel.

The Occurrence of Oxytetracycline (OTC) in Local Groundwater beneath Fish Pond

The aquaculture is one of the main contributors of antibiotic residues to the environment. World wide, millions of tons are released annually to the aquatic environment ever since it is given to fish as growth promoter and for therapy as well. In Israel, most of this industry located above groundwater aquifers, which can badly be contaminated by leaching pollutants. Thus, the main objective of this study is to examine the infiltration potential of Oxytetracycline (OTC) towards the nearby groundwater well, and to identify the hydrological connection between the fish pond which acts as a point source of antibiotic pollution to the local ground water.

The identification and quantification of the antibiotic residues (OTC) were determined using analytical methods including SPE and HPLC-UV-MS/MS.

Field work results showed relatively fast infiltration of Oxytetracycline towards ground water well (M/2) which is characterized by local cone of depression due to an intensive pumping. In addition, saturated preferential flow paths which exist beneath the pond, enabled the pollutant (OTC) to rapidly reach to groundwater levels skipping on anticipated sorption processes to the local sediments.

These findings demonstrate that fish pond industry may cause severe affect to the local groundwater quality.

Silvia Barbero
Researcher, Politecnico di Torino, Italy.

Territorial Nets of Energy for Local Economic Development

Local Economic Development has significance within the cultural context in which it operates and is increasingly important in international cooperation. The implementation of an approach that goes beyond a specific solutions is needed; it tends to create **connections between local material, energy and knowledge resources, generating multiple and complex solutions**. Above all, **energy** is a *common good*, considered a fundamental need and shared by the society, but also it is an *individual right* to increase the capabilities.

The **research methodology** is based on the combination of theory and practice that resolves in a **cross analysis**. The **theory of Systemic Design** and **the practice of case studies** are tacked with the same key questions: *what, why, when, where* and *how*. The **analysis of complex systems by scientific means** with societal relevance supports decision making, that approach turns environmental problems into business opportunities. **The eight case studies** have been chosen for **approach**, **size**, and **experiences**. The selection is based on the production of bioenergy, the complex relations with more or less large networks of companies, the compliance with the Systemic Design principles, above all, the tendency to zero emissions. The **cross analysis** of these case studies and of the theoretical/practical parts is crucial to find the main results for designing the framework.

In conclusion, the adoption of more **systemic production and person-centered approaches** holds great potentiality to create **Local Economic Development**. In the field of renewable energy the creation of **sustainable infrastructures and agile energy systems could help the development of territories**. Furthermore, the **designed framework is tested** in a micro-system (Agrindustria) to verify it with continuous feedbacks and to realize a concrete replicable pilot project. It is demonstrated that the green energy production in systemic nets of small and distributed plants helps the success and the sustainability of territories.

Deniz Bingol
Ph.D., Kocaeli University, Turkey.
Salih Aydogan
Selçuk University, Turkey.
Seda Karayunlu Bozbas
Ph.D., Kocaeli University, Turkey.

Optimization of Dry Mechanochemical Conversion Conditions of SrSO4 to SrCO3

Celestite occurs in nature and is used as the major starting material for the production of strontium compounds. Celestite is converted to $SrCO_3$, the common commercial form of strontium by different methods. The optimization of dry mechanochemical conversion conditions of celestite to strontium carbonate using ammonium carbonate were made by design of experiments. Two variables (rotational speed of mill and $(NH_4)_2CO_3/SrSO_4$ mole ratio) were regarded as factors in the optimization. The experimental optimization step was performed by a three–level full factorial design. The rotational speed of mill was found as the most significant factor that affected the conversion. The three–level full factorial design was successfully applied to the dry conversion of celestite, $SrSO_4$, to $SrCO_3$ using ammonium carbonate in a planetary type ball mill. A 98% conversion of celestite to $SrCO_3$ was obtained in 400 rpm by increasing the mole ratio of $(NH_4)_2CO_3/SrSO_4$ to 2:1.

Jacqualyn Blizzard
NSF Graduate Research Fellow, Clemson University, USA.
Leidy Klotz
NSF Graduate Research Fellow,Clemson University, USA.
Jeffery Plumblee
NSF Graduate Research Fellow,Clemson University, USA.

A Whole-Systems Approach for Designing Sustainable Infrastructure

Aristotle theorized, "The whole is more than the sum of its parts." Design engineers often overlook this simple philosophy. We employ a reductionist approach when designing the built environment: engineering solutions for the individual parts rather than the system as a whole, creating and exacerbating problems in the process. A whole-systems, interdisciplinary approach that considers the interrelatedness of global issues is increasingly recognized as essential to finding truly sustainable engineering solutions [1]. However, both the precise nature of this whole-systems approach, as well as the best ways to incorporate it in engineering education remain undefined. To help address this gap in knowledge, this project will: (1) methodically review the literature and conduct exploratory case studies to define and unify the general principles of whole systems design; (2) develop a strategic process model for whole-systems design for the design of green infrastructure and sustainable cities; and (3) assess methods and materials to teach these principles to designers in industry, and students at Clemson University. The integrated nature of the research will help initiate a much-needed paradigm shift to encourage whole-systems approaches in the problem-solving strategies used by design engineers. Systems thinking will produce solutions that efficiently address the ecological, social, and economic demands of the system as a whole, a key to building sustainable cities of the future.

[1] NSB. Moving Forward to Improve Engineering Education. Rep. no. nsb07122. NSF, 17 Dec. 2007. Web. 22 Oct. 2009. <http://www.nsf.gov/pubs/>.

Jeffrey Brown
Ph.D. Student, Gothenburg University, Sweden.

Metabolic Profiling and P-Glycoprotein Activity Assay Show Altered Physiology of Earthworms Exposed to Dairy Shed Effluent

This is the second only paper using *Aporrectodea caliginosa* exposed in a field situation, detailing changes in both the aqueous and lipid metabolomes, and the first where potential effects of dairy shed effluent applied to agricultural pasture have been investigated using ^{1}H NMR-metabolomics. Strong similarities with a previous study were found in the changes of the earthworms aqueous metabolites, confirming alanine, maltose and fatty acids as sensitive biomarkers of the earthworms' physiology. Other metabolites found to be significantly higher in the effluent exposed earthworms were glutamine, glutamate and malate. The earthworm specific metabolite 2-hexyl-5-ethyl-furansulfonate (HEFS), previously suggested as a biomarker of contaminant exposure, was found to be largely responsible for variation within each treatment group, but was not a significant class-separating variable as determined by orthogonal partial least squared discriminant analysis (OPLS-DA). The altered metabolism may be due to changes in activity of cellular P-gp efflux transporters, which showed reduced activity as measured by the relative net accumulation of Rhodamine B dye, a known substrate of P-gp. Further study is required to assess the precise causes of these effects and their implications to the health of *A. caliginosa* populations.

Jie Chang
Professor, South China University of Technology, China.
Jinjiang Wang
South China University of Technology, China.
Juan Fan
South China University of Technology, China.

Catalytic Upgrading of Bio-oil over Ion Exchange Resin Catalysts

The production of bio-oil from fast pyrolysis of biomass has aroused widespread attentions as a potential substitute for fossil fuels. However, the drawbacks including high acidity, low heating value and high corrosiveness of bio-oil limit its usage as a high grade/transportation fuel. The authors proposed a bio-oil upgrading method by catalytic esterification. During catalytic esterification reactions, the organic acids in bio-oil were converted to their corresponding neutral esters, therefore, the contents of organic acids were reduced in bio-oil, and the quality of bio-oil would be greatly improved. At first, the catalytic activity was investigated by model reaction to obtain optimum catalysts and reaction conditions. Then, the esterification of bio-oil with methanol was conducted in a batch reactor. We selected 732 and NKC-9 type ion exchange resins as esterification catalysts for upgrading of bio-oil.

The results showed that acid numbers of upgraded bio-oil on 732 resin and NKC-9 resin were lowered by 88.54% and 85.95% respectively, which represents the conversion of organic acids to neutral esters; the heating values increased by 32.26% and 31.64% respectively; the H_2O contents decreased by 27.74% and 30.87% respectively; the densities were both lowered by 21.77% and the viscosities fell by 97% approximately. Besides, fixed bed reactor was employed for continuous catalytic esterification of bio-oil by 732 resin and the acid number remarkably decreased by 92.61%. The accelerated aging test showed improvement of stability and the aluminum strip corrosion test showed reduced corrosion rate of bio-oil after upgrading.

It can be concluded that catalytic esterification is a promising method for the upgrading of bio-oil.

Yen-Hua Chen
Assistant Professor, National Cheng Kung University, Taiwan.
Yu-Der Chen
Master Student, National Cheng Kung University, Taiwan.

Synthetic Procedure Dependent on Cu(II) Adsorption Activity of $BaTiO_3$ Nanoparticles

In this study, $BaTiO_3$ nanoparticles (BTO1, BTO2, BTO3) with different synthetic procedures are fabricated via a modified co-precipitation method. They are all polycrystalline with a cubic perovskite structure. Among them, BTO3 has the smallest particle size (25 nm) and the largest surface area (36.32 m^2/g). Afterward the Cu(II) adsorption process of different BTO nanoparticles is carried out by batch experiments. It is observed that all the samples possess a high adsorption capacity for copper ions. The maximum Cu(II) adsorption capacity is 28.49, 26.25, and 20.53 for BTO3, BTO2, and BTO1, respectively. Further, the experimental data are well fitted to the pseudo-second-order equation for BTO1, and is pseudo-first-order equation for BTO2 and BTO3. This means BTO nanoparticles with different synthetic process will have different adsorption kinetic behavior. It also suggests that Langmuir isotherm is more adequate than Freundlich isotherm in simulating Cu^{2+} adsorption isotherm of all the three specimens. Therefore, these findings indicate that $BaTiO_3$ nanoparticles are effective materials for Cu^{2+} removal, and they may be applied in the removal of heavy metal ions from aqueous streams.

Tin-Tai Chow
Associate Professor, City University of Hong Kong, China.
Shaoting Dong
MPhil Student, City University of Hong Kong, China.

Energy Performance of Solar Water Heating Systems in Subtropical Hong Kong

Renewable energy utilization is currently encouraged in Hong Kong to fight against climate change. Solar energy is one oldest but well developed technology among the various means of renewable energy applications. This is particularly the case for the places in the Far East where the latitude is low and so the solar energy resource is plentiful and the sunshine hours are stable. Nevertheless, comparing with many countries in the north, the growth of solar energy applications in this warm and hot climate region has been slow in the past decades. In Hong Kong as an example, the performance of many solar devices are so far not clearly reported and their relatively merits are now subjects of interest to the industry.

In this article, the opportunities in the use of solar energy in Hong Kong will be discussed. Illustrative cases and examples will be quoted such as evacuated tube solar water heating devices, solar assisted heat pump, hybrid solar technology, and the like. In particular, our experimental work on: (i) the two-phase solar collector, and (ii) the conventional evacuated-tube solar collector, for stand-alone water heating application will be described in details. Our experimental results show that: (i) the daily solar energy absorption efficiencies of the two-phase solar collector is higher than those of the conventional evacuated-tube solar collector for domestic applications; (ii) at night time the average coefficient of heat loss of the water-in-glass manifold system is higher than that of the heat pipe system. The general conclusion is that the energy performance of the heat pipe solar heat collector is better than that of the water-in-glass manifold solar heat collector in subtropical Hong Kong.

Jordan Clark
Professor, University of California, USA.

Investigation of Groundwater Flow Variations near a Spreading Pond with Repeat Deliberate Tracer Experiments

At ISMAR-06 symposium (Phoenix 2007), Fox et al. presented a numerical study of flow beneath the Mesa spreading ponds (AZ) to set criteria for the installation of a groundwater mound monitoring well. Using a geostatistical technique to characterize the subsurface heterogeneity, they tested more than 50 possible hydrogeological fields. Their results demonstrate that the combination of subsurface heterogeneity and wetting cycles (when and where recharge occurred) greatly influenced subsurface travel times to potential well locations directly below the ponds. Fox et al. study has significant implications for results from deliberate tracer studies that are generally conducted during one hydraulic condition. Deliberate tracer experiments are the best method for determining travel times and identifying preferential flow paths between recharge ponds and wells. This information is often needed for permitting or for evaluating subsurface water quality changes. This paper compares the results of two deliberate tracer experiments at Kraemer Basin, Orange County, CA, USA. Results from the first experiment, which was conducted in Oct 1998, showed a region of highly transmissive material extends down gradient from the basin for more than 3 kilometers (Clark et al., *Ground Water*, Vol. 42(2), pp. 167-174, 2004). Mean groundwater velocities were determined to be approximately 2 km/yr in this region based on the arrival time of the tracer center of mass. A second experiment was initiated in Jan 2008 to determine if travel times from this basin to monitoring and productions wells changed during the past decade in response to new boundary conditions. Results indicate that flow near Kraemer was stable and travel times to all wells determined during both experiments agree within the experimental uncertainty. It is likely that the tracer experiment results differ from Fox et al. because of the larger spatial scales of the Californian location.

Mehmet Coelhan
Professor, Technische Universität München, Germany.
Bettina Hilger
PhD Student, Bavarian Health and Food Safety Authority, Germany.
Hermann Fromme
Professor, Bavarian Health and Food Safety Authority, Germany.
Wolfgang Völkel
Professor, Bavarian Health and Food Safety Authority, Germany.

Determination of Chlorinated Paraffins in House Dust Samples

Chlorinated paraffins (CPs), also known as polychlorinated n-alkanes (PCA), are complex mixtures consisting of thousands of isomers which are also not possible to be completely separated by HR-GC. The technical mixtures are produced by chlorination of n-alkane feedstock under forcing conditions; over 200 commercial products with different compositions are available. Thus, for a proper quantification a suitable standard has to be selected. For these reasons, the analysis of CPs is difficult and only limited information on CPs in environmental samples are available.

With reference to their chain lengths, CPs are classified as short (C10-C13), middle (C14-C17) and long (C18-C30) chain chlorinated paraffins (SCCPs/MCCPs/LCCPs). Corresponding to their intended use, the chlorine content varies between 30% and 70%. The application range of CPs is wide: e.g. as fire retardants, plasticizers or additives in paints, sealants or rubber and in a number of other industrial applications. Annual global production of CPs is assumingly more than 600 kilo tonnes, with a majority having MCCPs. Since 2004, SCCPs may not be used (in concentrations higher than >1 %) in metal-working and for liquoring of leather in the European Union.

A new quantification approach was used to determine short- (SCCPs) and medium chain chlorinated paraffins (MCCPs) in house dust samples by gas chromatography electron capture negative ionization mass spectrometry (GC-ECNI-MS). Different polychlorinated n-alkanes were used to construct a correlation function between detector response and chlorine content of the standards. The chlorine content of the samples was estimated by comparison of their congener group pattern with the pattern of the standards. Extraction of the sieved dust samples was carried out in ultra-sonic bath. Concentrations were between 5 µg/g and 891 µg/g.

Anjeza Coku
Biologist, University of Tirana, Albania.
Mirela Lika
University of Tirana, Albania.
Roland Bani
University of Tirana, Albania.

Microbiological Quality of Minimally Processed Vegetables Sold in Tirana, Albania

Minimally processed vegetables go through different steps during their preparation. However, they must maintain the same quality as the fresh products. The aim of this study is to survey the microbial quality of minimally processed vegetables, because the health of consummators can be affected by consumption of microbiologically unsafe food. Microbial contamination can occur directly or indirectly during human handling, peeling, washing, preservation, transport. A survey of minimally processed vegetables in Tirana city is conducted during 2010.

A total of 115 vegetables and salad samples, were analyzed for presence of MAM, for total coliforme, presence of *E.coli* and other pathogens related to vegetables. The samples were collected casually at different areas of Tirana city. The results indicate that minimally processed vegetables sold in different markets of Tirana city, over 70 % had good microbiological quality. *Enterobacteriaceae* populations between 10^5 and 10^6 CFU/g were found in 12 % of samples. *Citrobacter freundii* was found in 8 vegetable samples. *Serratia ficaria* was found in 6 vegetable samples. *Enterobacter agglomerans* was found in 7 cases, *Lysteria spp* was found in 3 vegetable samples, *Bacillus cereus* was found in 2 salad sample and *E.coli O157* were not found.

Suman Das
Assistant Professor, Charuchandra College, India.

Concurrent Biosorption and Biotransformation of Hexavalent Chromium by Immobilized *Aspergillus Flavus* Strain Isolated From Tannery Wastewater

As conventional physico-chemical heavy-metal remediation technologies are becoming extremely expensive, the possibility of use of microorganisms in bioremediation or biorecovery of different heavy metals from industrial effluents is extensively explored by different workers. Concurrent biosorption and biotransformation of Cr (VI) by PVF-immobilized live chrome-resistant wastewater isolate of *Aspergillus flavus* was studied under different cultural conditions. In batch-culture of chromium supplemented media effects of different parameters like pH, temperature, initial Cr (VI) concentration, additional metals or nutrients were studied. Neutral to slightly alkaline pH was found to be best for bio-accumulation while pH 8.0 is best for reduction to Cr (III). The strain was more efficient in lower concentrations (25-50 ppm) of chromium in absence of other metal ions. Additional nutrients like cheap sugar-molasses promote biosorption as well as bio-reduction to remove more than 95% hexavalent chromium. Even with cheaper source like sugarcane-molasses 95% removal was possible. Biosorption by alginate-immobilized fungal biomass has very high correlation with the Freundlich adsorption isotherm as r^2=0.9656. Adsorption capacity (k) was found to be 11.85496. Adsorption intensity was 0.3566 i.e. <1 confirming favourable adsorption. Up scaling of the experiment with this strain is therefore necessary to evaluate possibility of applying in industry. In underdeveloped countries like ours such an effluent treatment system where little infrastructure, manpower and recurrent cost is involved, is of immense importance in pollution abatement technology.

Mohamed Dawoud
Manager, Water Resources Department, Environment Agency, UAE.

Treated Wastewater Management and Reuse in Arid Regions: Abu Dhabi Case Study

In arid regions treated wastewater is an environmental, social and economical resource that needs to be managed in appropriate way. Reusing of treated effluent that is normally discharged to the environment from municipal wastewater treatment plants is receiving an increasing attention as a reliable water resource. The volume of this resource is being considered in the planning and implementation of water resources projects. Irrigating agricultural crops with recycled wastewater has been practiced in arid and semi arid regions and is rapidly getting popular in the countries of the Arab Regions. In Abu Dhabi Emirate the annual production of treated wastewater is about 450 million m^3 which is about 7.2% of the total Emirate water production. Only about 60% of the treated wastewater is reused in wetlands, landscaping and recreation areas due to the capacity of distribution system after treatment. Recently, a new strategy for assessing the alternative options for reusing the treated wastewater was developed including irrigation of agriculture crops and aquifer recharge. Irrigating agricultural crops with recycled wastewater has been practiced in arid and semi arid regions and is rapidly getting popular in the countries of the Arab Region.

Reuse of treated wastewater involves several types of risks: Health, Environmental, Economic and Strategic. It is difficult to measure these risks. This paper presents the assess the different options for reuse of the treated wastewater and map out the risks creating a basis of understanding for the continuation of the work plan that will create financial functions representing various risks. However, when making such an analysis, one must consider the cost of avoiding the development of a treated wastewater supply project.

Claudia De Giorgi
Researcher in Industrial Design, Politecnico di Torino, Italy.
Cristina Allione
Researcher, Politecnico di Torino, Italy.
Beatrice Lerma
Researcher, Politecnico di Torino, Italy.

Design and Product. Eco-Compatibility Perception of the Materials and Product

According to the most advanced orientation of design culture, the choice of the materials suitable for a given project should be dealt with in the metaplanning phase, which is thus extended and charged with meaning: in fact, the materials have a recognised weight in the project, they support the technical functions and at the same time they create its personality.

In the ongoing process of innovation in the field of materials research the topic of perception of the materials has become central, their expressive-sensorial properties, elegant and accentuated, have acquired growing importance: the way Man perceives materials and evaluates his experience of them is increasingly taken into consideration. This new and complex approach to the project, and in particular to the metaproject, is organised through the critical exploration of the materials and is completed with the support of virtual reality and prototyping. Real and virtual models of design proposals showing the maps of the materials to be evaluated are presented to the client, using both traditional and new methods.

The decisions made by the designers according to technical criteria, costs, the sensorial and environmental characteristics can in fact be evaluated, also unknowingly, through the use of non-verbal methodologies and equipment, such as the eye-tracking machine, a hypothetical means of final verification. Eye-tracking offers important elements regarding the capacity of the product/interface to attract/hold or to rebuff the attention of the observer: it is based on the registration of what a subject observes or ignores, when deciding to take into consideration a given product. The analysis is applicable with equivalent efficacy to real and virtual prototypes: an interesting move towards virtuality thanks to the optimisation of costs offered by the equipment.

The paper will deal with the explaining of the innovative method of evaluation of materials for the metaproject, with particular awareness of the eco-compatibility perception in case studies.

Manuel Diaz
Researcher, University of Chile, Chile.
Raúl O'Ryan
Associate Professor, University of Chile, Chile.
Jacques Clerc
University of Chile, Chile.

Energy Demand and Greenhouse Gas Emissions for Chile in 2030: Mitigation Options and Costs

Climate change will require that developing countries reduce their greenhouse gas (GHG) emissions. Chile in particular, as a new member of OECD, will have to develop a low emission strategy sooner than most developing nations. In this paper we identify alternative mitigation actions and their costs for Chile. Based on an energy end use model, GHG emissions are estimated in a Bau scenario for 2030 together with potential reductions.

The results show that in the absence of specific policies, emissions from energy use will increase more than 3 times relative to 2007. Significant increases in emissions from both the transport and energy sectors are expected. This is basically the result of the high economic growth rates assumed for the period.

The main abatement options and costs have been identified for each sector allowing the construction of an abatement cost curve. Based on this, the potential for mitigation has been estimated. Two mitigation scenarios have been analyzed. A first "early actions" scenario allows estimating the reductions from measures taken by Chile ahead of any voluntary commitments or external obligation scenarios. These include initial energy efficiency efforts, introduction of non conventional renewable energies such as wind and geothermal, and improvements in public transport. A second scenario considers all measures with costs below US$10 per ton. The results show that expected emissions in 2030 can be reduced 30% at reasonable costs, however total emissions would still increase substantially relative to 2007. Energy efficiency plays a very important role, and the introduction of NCRE a more secondary one. Stricter emissions reduction goals would imply very significant increases in costs.

Ayse Erdem Aknesil
Associate Professor, Beykent University, Turkey.
Neşe Yugruk Akdag
Associate Professor, Yildiz Technical University, Turkey.

Legal Regulations Governing Noise Control in Turkey and Examples of Environmental Noise Determination Studies in Istanbul

Population increases in cities lead to noise pollution as a serious environmental problem. The negative impacts of noise on human health, behaviour and efficiency have so far been demonstrated by a number of academic studies. Hearing comfort is defined as the proper acoustic conditions suitable for various human activities such as resting, studying and entertainment. The first and most important precondition for hearing comfort is noise control. Noise control encompasses all attempts at and precautions for limiting noise in a way to eliminate any harm to humans. Levels of noise control are particularly important in minimising or totally eliminating the unwanted impacts of noise.

As in any other country, Turkish laws and regulations on noise control attempt to secure hearing comfort related rights and needs of both the individuals and the public. Until recently, such laws and regulations were quite limited in Turkey. However, in line with the Country's EU accession process, these rules and regulations were revised and their coverage was expanded. The regulations are primarily prepared by the related ministry in the form of laws, communiqués and codes.

This article includes a review of the Turkish legislation on noise control with a particular focus on 'Assessment and Management of the Environmental Noise', dated June 4, 2010. This regulation sets fort the action plans for preventing and reducing noise at locations where environmental noise quality must be maintained. It also details how these action plans are to be implemented. The article also discusses examples of previous noise determination and evaluation studies conducted in Istanbul and draws links to the regulation. To this end, certain noise maps are included in the article.

Israel Felzenszwalb
Associate Professor, State University of Rio de Janeiro, Brazil.
Claudia Rainno
Ana Maria Velho
Claudia Aiub
Sergio Correa
Mazzei Jose Luiz
State University of Rio de Janeiro, Brazil.

Evaluation of Urban Airborne Particulate Matter (PM2.5) in the City of Rio de Janeiro (Brazil) by Mutagenicity Assays

Air pollution causes adverse effects to the environment and to human health. The concentration of fine particles (PM2.5) in urban areas has been associated with the increases in the morbidity and in the mortality indexes of the exposed populations, therein the importance of this study. Ambient air genotoxicants can originate from emission of fuel combustion, waste incineration and industrial processes, and they are also formed by atmospheric reaction. Generally, the mutagenicity of air bone combustion particle is attributed primarily to polycyclic aromatic hydrocarbons (PAHs), but recent reviews demonstrate that these compounds are not the predominant class of mutagens found in airborne particles, although they contribute significantly to mutagenicity. A wide range of aromatic compounds, such as nitroarenes, are found in ambient air and are present in emissions from direct sources or may be products of atmospheric reactions in the presence of NO_2 and NO_3 radicals. The objective of this work was to investigate the presence of mutagenic activity using *Salmonella/microsome* assay (described by Kado) on samples of particulate matter performed collected at three sites (Brasil Avenue, Rebouças Tunnel and in Rio de Janeiro University State – UERJ Campus - low traffic) in Rio de Janeiro city between April and July 2010. Each of the PM2.5 samples (4) were collected on glass filters using high-volume collector (AVG MP 2.5) for 24h in Brasil Avenue and UERJ campus. In Rebouças Tunnel each sample (4) was collected for 6h. The filters were pooled to obtain monthly samples. Half of each filter containing particulate matter was submitted for extraction sequentially by sonication with dichloromethane. Prior to bioassay performance, the organic extract was dried at 4°C and resuspended in dimethyl sulfoxide. For each sample *S. typhimurium* TA98 (frameshift strain) was used, with and without metabolization (S9 mix), beside the derivative strains TA98DNP$_6$ (transacetylase deficient), YG1021 (nitroreductase-

overproducing) and YG1024 (*O*-acetyltransferase-overproduction). Five concentrations from each sample (10-50 μg / plate) were tested in triplicate. Results were expressed as a mutagenic index (MI) which is equal to the ratio between the number of *His*$^+$ induced in the sample and the number of spontaneous *His*$^+$ in the negative control. For both month positive mutagenicity results were detected, both in the presence and absence for S9 mix, in Brasil Avenue (M.I. 2.08 - 7.05) and Rebouças Tunnel (M.I. 2.1 – 23.39), especially in the YG1024, suggesting the presence of high concentration of nitroderivates PAHs in those sites. Nevertheless, we have to take into consideration that the filters exposure in the Tunnel is four times less that in Brasil Avenue. The negative data observed at the UERJ Campus reinforce the choose of this site as our "blank" for the research.

Zenon Foltynowicz
Professor, Poznań University of Economics, Poland.
Christer Forsgren
Technical Director, Stena Metall AB, Sweden.
Carina Pettersson
Ph.D., Stena Metall AB, Sweden.

Food Waste Treatment on Ships by Microwave Drying

On ships, restaurants, commercial kitchens, etc. the space to handle waste that is biodegradable is often very limited. In some instances special refrigerator rooms are used to reduce the risk of uncontrolled biodegradation generating bad smell and attracting animals like rats.

It is important to decrease the amount of food waste. An elimination of water in the material will simplify the possibility to store the material and avoid bad smell, and risk contamination.

A new food waste treatment system was developed and evaluated in order to handle the material on ships in a resource effective way by microwave drying.

The applied equipment is based on the optimized Gisip microwave drying system, including modules that cover safety and security components, based on Netaccess and ABC Liros system. With the elaborated technique food waste is rapidly turned into a dry sterile powder that is possible to store for a long period of time. Heating with microwaves is rapid, energy efficient and heats to sterilize not only on the surface, but strait through.

The developed system will be tested and evaluated on the Stena Line destination to England, Poland and Sweden.

The treated material could be used for applications like pellets production and other application as fuel material due to their caloric value.

Specifically, the intention in the commercial introduction is to show business a resource and cost effective alternative which also will contribute to the practical implementation of EU Landfill Directive.

Adriana Franca
Associate Professor, Federal University of Minas Gerais, Brazil.
Luis Carlos Oliveira Silva
Federal University of Minas Gerais, Brazil.
Leandro Oliveira
Associate Professor, Federal University of Minas Gerais, Brazil.

Development of an Adsorbent Based on Spent Coffee Grounds for Wastewater Treatment - 1: Batch Adsorption Studies

Spent coffee grounds (SCG), a residue from soluble coffee production, pose several disposal problems, given their limited use as animal feed or fuel source and its possible use for the adulteration of roasted coffees. A few studies are available on the use of this residue for preparation of adsorbents, with applications in wastewater treatment for removal of heavy metals and dyes. Thus, the objective of the present study was to evaluate the potential of SCG for the production of adsorbents for phenol removal. The SCG were submitted to several chemical activation procedures. The evaluated activating agents were phosphoric acid, hydrochloric acid, nitric acid, sodium hydroxide, potassium hydroxide, sulfuric/nitric acids, and ammonia/hydrogen peroxide. Among the evaluated treatments, the one that was more effective in terms of phenol removal while providing the highest yield was treatment with potassium hydroxide (KOH at 8 mol L^{-1}, 3 h under sonication at 60 °C). Batch adsorption studies were conducted and the effects of initial phenol concentration, contact time, adsorbent dosage and initial solution pH were investigated. Adsorption kinetics was determined by fitting pseudo first and second-order kinetic models to the experimental data, with the second-order model providing the best description. Langmuir, Freundlich and Tempkin adsorption models were fitted to the equilibrium data, with Langmuir and Tempkin models providing the best fits. Maximum adsorption capacity was 36 mg L^{-1}. The results obtained in the present study indicated that spent coffee grounds are appropriate raw materials for production of adsorbents with application in wastewater treatment.

Ashok K. Giri
Deputy Director, Indian Institute of Chemical Biology, India.

Arsenic Induced Health Effects and Genetic Damage: Role of Climate Change in Arsenic Contamination in Ground Water

In West Bengal, India the ground water of the 9 out of 16 districts have been contaminated with very high arsenic concentration ranging from 50-800 µg/l. This is regarded as the greatest arsenic calamity in the world. We have assessed the arsenic induced health effects and genetic damage as measured by micronuclei formation and chromosomal aberrations in the symptomatic (individuals with arsenic skin lesions) and asymptomatic (individuals with no arsenic skin lesions) individuals exposed to same arsenic contaminated water. Single nucleotide polymorphisms (SNP) were analysed between skin lesions and no skin lesions individuals to find out the genes responsible for arsenic susceptibility. The incidence of health effects i.e. neuropathy, eye problem and respiratory diseases and genetic damage were significantly high in the symptomatic and asymptomatic group when compared with unexposed group. SNP studies indicate that there are certain genes that may be responsible for arsenic susceptibility. Attempts have also been made to find out the role of climate change in ground water arsenic contamination. To elucidate the role of climatic parameters (rainfall, temperature and level of water table) on groundwater arsenic concentration in three arsenic affected basins in India i.e. Bengal basin, of West Bengal, Middle Ganga plain of Bihar and Barak basin in the Cachar district of Assam were collected and recorded in different seasons. The bacterial populations from the water and soil from these three areas were collected in different seasons and identified in order to understand how they mobilize the release of arsenic into the groundwater as also to elucidate the mechanisms of their arsenic-resistance and/or extrusion. The results of climate change parameters and the bacterial population from arsenic rich areas indicate that climate change and bacteria has a significant role in arsenic contamination in ground water.

Rishi Gupta
Senior Research Fellow, University of Delhi South Campus, India.
Girija Mehta
University of Delhi South Campus, India.
Yogender Pal Khasa
University of Delhi South Campus, India.
Ramesh Chander Kuhad
Professor, University of Delhi South Campus, India.

Production of Ethanol, the Second Generation Biofuel, from Corncob, an Agricultural Residue

Rapid developments are taking place round the world for the production of alternative fuels to decrease dependence on oil reserves as well as reduce greenhouse gases (GHGs). Among various biofuels, bioethanol produced from lignocellulosic biomass is the most promising renewable and carbon–neutral alternative to fossil fuels. Use of waste lignocellulosic biomass as a feedstock for bioethanol production is one of the most effective ways to fight both the energy crisis and environmental problems caused by biowaste accumulation and carbon dioxide emissions.

In the present study, corncob containing ~70 % (w/w) holocellulose has been used as a low-cost feedstock for bioethanol production. Among various inorganic and organic acids tested, the acid hydrolysis of corncob using HCl (1.5 % v/v) at 120°C for 30 min resulted in optimal recovery of sugars (360.0 mg/g) along with fermentation inhibitors such as phenolics and furans. In order to make the acid hydrolysate fermentable, various detoxification strategies were applied and the activated charcoal method was found to be highly effective with maximum removal of phenolics (95 %) and furans (80 %). The acid hydrolysed biomass was treated with sodium chlorite (4.0 % w/v), which removed ~90 % lignin. The delignified substrate, containing mostly cellulose, when enzymatically hydrolysed for 24 h at 50°C, exhibited >80 % saccharification. The acid and enzymatic hydrolysates, containing 38.43 g/L and 36.47 g/L sugars, when fermented with *Pichia stipitis* NCIM 3499 and *Saccharomyces cerevisiae* HAU produced 11.84 and 16.08 g/L of ethanol with corresponding yield of 0.31 g/g and 0.43 g/g, respectively.

The study demonstrated that the pretreatment (acid hydrolysis and delignification) of lignocellulosic feedstock can provide cellulosic material more susceptible to enzyme, which eventually can be fermented to ethanol. However, efficient yeast strains capable of

fermenting both hexose and pentose sugars simultaneously are the need of hour for cost-effective bioethanol production.

Sang Heon Han
Researcher, Korea Advanced Institute of Science and Technology, Republic of Korea.
Daejun Chang
Researcher, Korea Advanced Institute of Science and Technology, Republic of Korea.

Slab Residence Time Effect to the Efficiency of a Reheating Furnace for Steel Mill Company

A thermal efficiency analysis of a reheating furnace for a steel mill company requires precise investigation of combustion and flow characteristics. The feature of hot gas flow field has the deterministic role in heating slabs. Burners are positioned slightly slanted with respect to axial direction to have more hot gas flow reach the slabs. Other factors such as type of fuel, slab residence time, location of slabs, thermal properties of slabs, and geometry of slab supporting system are also important. In this study, a 3D unsteady simulation of a reheating furnace was performed to investigate its efficiency with respect to slab residence time among the various factors described above. Too long residence time decrease the efficiency of the reheating furnace as well as too short residence time. This study found out the optimum residence time for given geometry and operating conditions of a reheating furnace through numerical calculation. Skid posts and beams also are included in the calculation because they disturb radiation heat transfer from hot combustion gas to the slabs. Numerical analysis is performed by using FLUENT. A User-Defined Function (UDF) program has been developed to process the movement of slabs because FLUENT cannot handle the movement using its default functions. When the mean temperature of a slab emitted to the rolling mill becomes invariant, calculation is considered to be converged and is terminated. This convergence criterion is appropriate for achieving an analytical solution. Over 55 new slabs have to be inserted to get a converged solution.

Matthijs Hisschemoller
Associate Professor, University of Amsterdam, The Netherlands
Ino Sioziou
University of Amsterdam, The Netherlands.

Boundary Organizations for Resource Mobilization Enhancing Citizens Involvement in the Dutch Energy Transition

This paper is looking into the issue of governance with regard to energy transition treating governance from a bottom-up perspective which envisages environmentally conscious citizens and non-state actors as viable players in the decision making process. Is a new environmental movement emerging? How would such a movement look like? In what respect would this new movement be similar and different from the institutionalized environmental NGOs originating from the sixties and seventies of the last century? Would such a movement have any potential to really speed up the energy transition? More particularly, the research illustrates new environmental movements in the Netherlands which try to accelerate the transition to a more sustainable energy system. This approach links social movements theories and collective action to insights on Boundary work and Boundary Organizations in the production, dissemination and use of knowledge. Furthermore, it introduces a new authentic approach towards Boundary Organization notion (bottom-up) in contrast to the traditional top-down approaches (IPCC). Six organizations have been identified and studied as bottom-up Boundary Organizations. Moreover the data has been substantiated by several stakeholder dialogue projects organized and facilitated by the Institute for Environmental Studies and other Dutch research institutes in the period 1999 - 2010 Resource mobilization framework have been employed as an analytical tool to scrutinize the infrastructure, structure, network and actors involved in the aforementioned organizations. The goal of the research is to elicit the main barriers that the organizations are confronted with and assess the movement's dynamic in the future.

Bin Hu
Assistant Professor, Central University of Finance and Economics, China.
Ross McKitrick
Central University of Finance and Economics, China.

Climatic Variations and the Market Value of Insurance Firms

Major insurance and reinsurance firms have expressed concern that global warming will threaten the industry due to extreme weather events. Past studies have examined the connection between global warming trends and extreme weather, and between extreme weather and the value of insured damages. In principle, if weather-related threats are increasing, insurance firms may face higher payouts, but they may also enjoy an expanded market for insurance products. They may be better off if they are able to price the new risks appropriately. We use cointegration analyses to investigate the relationships among key climatic indicators and the market value of insurance firms in recent decades. Our weather variability indicators include the US Climate Extremes Index and the Accumulated Cyclone Energy Index, while our global warming indicators are Mean Sea Surface Temperatures (SST) and Lower Tropospheric Mean Air Temperature (LTT). We examine monthly share values for some of the largest insurance and reinsurance firms in the world. We find no long-run cointegration between share prices and temperature indexes, which either implies that global warming is not directly linked to extreme weather events or that weather does not affect share values. We also find that increases in the Climate Extremes Index and Accumulated Cyclone Energy Index are associated with an increase in the returns to insurance firm shares. Overall, our results suggest that global temperature trends are unlikely to have a negative effect on the market value of insurance firms. In addition, it would be inefficient to use greenhouse gas mitigation strategies as a way to deal with increased future potential costs for insurance industries, since the losses may have nothing to do with global warming.

Asmida Ismail
Ph.D. Student, Imperial College London, UK.
Simon Archer
Imperial College London, UK.
Jeffrey Bates
Imperial College London, UK.

Effects of Atmospheric Pollutants on the Distribution of Epiphytic Terrestrial Algae along Pollutant Gradient of London Transect

Subaerial algae came to be regarded as the most pollutant-tolerant epiphytes during the era of high SO_2 pollution in UK cities, until the late-mid 20th century. Since then, an increase in abundance of subaerial algae is possibly linked to the decline in SO_2 concentrations and or increase in NO_x. The aim of this study was to understand how contemporary atmospheric pollutants influence the abundance and diversity of subaerial epiphytic algae. A 70km transect from the UK countryside into central London has been used to investigate the algal growth in relation to concentrations of atmospheric pollutants. Methods involved scrapping algae from the bark of oak trees (*Quercus robur*), within 15 x 15cm quadrats at 1.3 m height above ground, followed by algal identification and counting by light microscopy and monitoring of environmental and pollutant data. The results revealed that the main feature is an increase in abundance of *Desmococcus olivaceus* on entering the built-up area, with an eventual decline in the sampling station in the city centre. This pattern strongly suggests that growth of *D. olivaceus* is favoured by some component of the city environment, presumably an atmospheric pollutant which is derived predominantly from motor vehicles. The concentrations of NO_2 and NO_x showed the expected systematic decline from high values at the city centre station to low levels in the countryside. At the same time, SO_2 concentrations were extremely low confirming that this is no longer a significant factor for epiphyte colonization of trees. Populations of at least one species, *Apatococcus lobatu,s* were negatively correlatred ($p=0.01$) with atmospheric concentrations of ammonia, but this was not consistently supported by the other genera studied.

Kedar Joshi
M. Tech Student, Indian Institute of Technology Bombay, India.
S. Sreedhara
Associate Professor, Indian Institute of Technology Bombay, India.

Performance and Emissions Analysis of Compression Ignition Engine Fuelled with Dimethyl Ether

The scarce and rapidly depleting conventional petroleum resources have promoted research for alternative fuels. Stringent emissions regulations are pushing for greener fuels for internal combustion engines. Dimethyl ether (DME) is an ultra-clean transportation fuel which burns smokeless and reduces nitrogen oxides (NOx) and Particulate Matter (PM) emissions. DME, with a chemical formula of CH3-O-CH3, is an organic compound from ether family which is gaseous at normal atmospheric conditions. Presence of oxygen element in the fuel itself is an added advantage. However, lack of natural lubricating property and viscosity limits the direct use of DME in conventional compression ignition engine.

DME may be liquefied at pressure of around 8-10 bar and blended with diesel to use in compression ignition engine as a fuel. Experimental and numerical investigations are done to evaluate the performance of DME in a single cylinder, four stroke Diesel engine. Experiments are conducted for different blends of DME with conventional diesel fuel. Effects of parameters such as fuel injection pressure, fuel injection timing etc., on engine efficiency, specific fuel consumption and emissions are investigated at various loads. The performance and emissions characteristics of DME-Diesel blends in compression ignition engine are compared with that for baseline Diesel engine.

Shahed Khan
Associate Professor, Duquesne University, USA.
McMahan Gray
Duquesne University, USA.
John Bultrus
Duquesne University, USA.
Irma Araujo
Duquesne University, USA.

A Unique Nanocrystalline Photo-Release Sorbent for the Capture and Sequestration of Carbon Dioxide from Air and Flue Gases

Capture of carbon dioxide from large sources of emission such as fossil fuel fired power plants is one of the important target in the ongoing effort to mitigate the effect of green house gases on global climate change. The present day sorbents for the capture of green house gas, carbon dioxide involves incorporation of organic amine onto large surface area porous solid via impregnation, post synthesis grafting and direct condensation. The release of CO_2 from the amine containing solid sorbents involves high temperature steam. In this work we report the synthesis and performance a unique photo-release sorbent (without having the surface layer of amines) that can efficiently capture the carbon dioxide from air and flue gases and importantly, release it under sunlight illumination at room temperature prior to its sequestration. Synthesis of this photo-release sorbent involves both nitrogen and carbon modification of nanocrystalline titanium oxide to form nitrogen and carbon modified titanium oxide (NCM-n-TiO_2). This photoactive sorbent was found to capture carbon dioxide efficiently with > 3.00 mole of CO_2 per I kg of the sorbent in the presence of moisture. This sorbent was found photoactive in both UV and visible regions of solar spectrum due to both nitrogen and carbon incorporation in the titanium oxide structure. Nitrogen incorporation was found to help to capture CO_2 efficiently. On the other hand carbon incorporation extended its photoactivity to the end of visible region as was determined by UV-Vis spectra. The captured CO_2 was found to be released efficiently from the sorbent under illumination of light. Efficient capture of CO_2 was demonstrated by thermo gravimetric (TGA) measurements. The adsorption and release CO_2 under illumination of light in slightly wet condition was determined by x-ray photoelectron spectroscopic (XPS) measurements.

Boo Cheong Khoo
Professor, National University of Singapore, Singapore.
Jun-Mei Zhang
Research Fellow, National University of Singapore, Singapore.
Heow Pueh Lee
Associate Professor, National University of Singapore, Singapore.
Chit Pin Teo
Assistant Director, Water Supply (Network) Department, Public Utilities Board, Singapore.
Nazarudeen Haja
Assistant Director, Water Supply (Network) Department, Public Utilities Board, Singapore.
Kai Qi Peng
Engineer, Water Supply (Network) Department, Public Utilities Board, Singapore.

Preliminary Numerical Study on the Understanding of Flow Pattern in a Potable Water Service Reservoir for Actual Service Condition

Study of flow pattern is of major interest in characterizing, designing and evaluating the working conditions of service reservoir. With the advancement of computational science and resources, Computational Fluid Dynamics (CFD) method could be a reliable alternative to physical flow tests. A salient feature of flow in the service reservoir is the changing inflow and outflow due to the variations in water demand and supply. However, the existing reported numerical studies of service reservoir are fairly limited to steady flow conditions with a fixed water level. To overcome the challenge of tracking water level variations for dynamic service condition, this study implements dynamic meshes method. The flow inside a service reservoir for one day (24 hours) is mimicked with the on-site measured water level and flow rate information. To analyze the flow pattern, we focus on four different phases of operating conditions. The first one is termed as refilling phase, when the outflow is marginal and the reservoir is undergoing refilling with increasing water level. The second one is referred as turn-over phase, when the inflow is marginal and the outlet valve is fully open. The remaining two phases represent the common service phase, with both inflow and outflow. At the refilling and common service phases, short-circulating of fluid is observed, because the inlet is located just opposite to the outlet. Accordingly two dead zones are found near each side of the lateral walls. The sizes and locations of these dead zones are almost unchanged during the flow process. However in the phase of turn-over, the flow re-circulating

region near the front wall migrates downstream and attracts more fluid moving downstream. This evolution of the re-circulating region promotes the mixing of fluids and provides the insight as to why the forced turn-over can be helpful in enhancing the water quality.

Jeong-Hoon Kim
Principal Investigator, Korea Research Institute of Chemical Technology, South Korea.
Hyoseong Ahn
Senior Research Scientist, Korea Research Institute of Chemical Technology, Korea.
Ho-Cheol Kang
Principal Research Scientist, Korea Research Institute of Chemical Technology, Korea.
Beom Sik Kim
Principal Research Scientist, Korea Research Institute of Chemical Technology, Korea.

Development of PES Hollow Fiber Membranes and Process for the Separation of CO2/CH4 Mixture in Landfill Site

Non-CO_2 greenhouse gases as well as CO_2 have also been issued today. CH_4 is 21 times more harmful than CO_2 and has the 2nd largest contribution to global warming among 6 greenhouse gases. CH_4 is emitted from landfill, anaerobic digestion of activated sludge, food wastes and animal wastes. It is sometimes called biogas which has the composition of CO_2 : CH_4 = 0.4~0.5 : 0.6~0.5 (mole fractions). To reduce global warming problem by CH_4, it should be separated and used as vehicle fuels or gas grid. The separation of CO_2 from CH_4 has been carried out via three common technologies: absorption, adsorption and membrane separation. In addition, the removal of H_2S and siloxane from biogas is also important. Membrane purification technology has economically many advantages over other processes: cheap construction of plant, simple automatic operations, dry-condition running in winter, and easy scale-up and downsizing. The objective of our study is to develop a hollow fiber membrane with polyethersulfone by dry-wet spinning and a membrane purification process for the vehicle fuel from landfill biogas. KRICT hollow fiber membranes showed excellent performance: CO_2 permeability of 100GPU, CH_4 permeability of 2.2 GPU and CO_2/CH_4 selectivity over 45. At the CH_4 concentration of 97% in retentate side, 68% of CH_4 recovery was observed in 1-stage process and 95% CH_4 recovery were obtained in 2-stage, respectively. A pilot and commercial membrane plant (0.1Nm^3/min and 1.0 Nm^3/min) are being constructed in Sudokwon Landnfill Site Management Corporation (SLC) in Seoul, Korea.

Mi-Sun Kim
Principal Researcher, Korea Institute of Energy Research, Republic of Korea.
Dong-Hoon Kim
Principal Researcher, Korea Institute of Energy Research, Republic of Korea.

Optimization of Various Culture Conditions for Photo-Fermentative Hydrogen and Fatty Acids Production by Purple Non-Sulfur Bactrerium, *Rhodobacter Sphaeroides*

Hydrogen is a clean and highly efficient fuel that produces water upon burning without generating CO_2. Among various H_2 production technologies, a biological approach has received special attention as a sustainable technology since the starting materials such as organic waste, water, and various gases are cheap and abundant.

Purple non-sulfur (PNS) bacteria are anoxygenic photosynthetic bacteria and produce H_2 under photo-heterotrophic conditions by nitrogenase in the absence of N_2, where its expression is strongly inhibited by O_2. Photo-heterotrophic H_2 production via nitrogenase is energy-intensive for the PNS bacteria due to the nature of N_2 fixation, however, they are good candidates for H_2 production because can utilize light as energy source and short-chain organic acids as carbon sources, which are produced from dark anaerobic fermentation by acid producing fermentative microorganisms.

In this paper, various factors including carbon, nitrogen, mineral sources, light intensity and pH, which affect the hydrogen production and cell growth were examined using purple non-sulfur photosynthetic bacteria, *Rhodobacter sphaeroides* KD 131 under anaerobic and photosynthetic culture conditions of 110 w/m^2 that used the illumination of a halogen lamp at 30^oC.

Tamara Kirin
Ph.D. Student, Università della Tuscia, Italy.
Maria Paola Tomasino
Università della Tuscia, Italy.
Marco Cosimo Simeone
Università della Tuscia, Italy.
Sandro Bogdanović
University of Zagreb, Croatia.
Bartolomeo Schirone
Università della Tuscia, Italy.

Inula verbascifolia – Biogeographic Inferences on a Mediterranean Endemic Medicinal Plant

Inula verbascifolia (Willd.) Hausskn. (Asteraceae) is an herbaceous perennial plant. Many species in this genus are used in herbal medicine[2] but interest for *I. verbascifolia* is increasing since cytotoxic agents, germacranolides, were isolated from one of its subspecies (*I. verbascifolia* subsp. *methanea*)[1]. This is why in this work we would like to provide a molecular insight on the taxonomy of this group. Center of its distribution is Greece, where several subspecies are recorded. The northernmost border of the species' range is the Mediterranean coast of Croatia, one of the most species-rich area of Europe. The taxon is also present in Italy on the Gargano peninsula, another Mediterranean hotspot of biodiversity.

Phylogenetic relationships among taxa of *I. verbascifolia* were inferred from plastid DNA sequences (*trnH-psbA*). Tested populations were sampled in Croatia, Italy and Greece. We found interesting patterns of intra-specific polymorphism. The Greek population was genetically notably different from all the others. Interestingly, one population in Croatia and both ones in Gargano shared the same DNA insertion. These results indicate the existence of a great variability among the populations of *I. verbascifolia*.

[1] Harvala E., Aligiannis N., Skaltsounis A.L., Pratsinis H., Lambrinidis G., Harvala C., Chinou I. (2001): Cytotoxic germacranolides from *Inula verbascifolia* subsp. *methanea*. J Nat Prod 2002; 65: 1045-8.

[2] Zhaoa Y.-M., Zhanga M.-L., Shi Q.-W., Kiyota H. (2006): Chemical Constituents of Plants from the Genus *Inula*. Chemistry & biodiversity – Vol. 3. 371 – 384.

Nasrin Kolahchi
Ph.D. Student, Islamic Azad University, Iran.
Mohseni Saravi
Faculty member of Tehran University, Iran.
Tavilli Ali
Faculty member of Tehran University, Iran.
Mohammad Jafary
Faculty member of Tehran University, Iran.
Ghasem Assadian
Faculty Member, Research Station of Agronomy and Natural Resources, Hamedan Province, Iran.

Ecohydrology Concepts in Arid and Semi-Arid Range Land

Threshold of twenty-first century, the water crisis in the priority country is encountering briefing policies and management as a principle thoroughly human, social, economic and political attention by the rulers countries is abundant. The World Bank has announced that the economy during the years 1960 to 2025 births, the rate for Middle East from 3430 year to 667 cubic meters per square meter appears and population growth, destruction of natural resources, vast deserts and expand knowledge in this is effective. Water resources management is now the real dynamic basin or words ecohydrology is of importance. Study basic definitions and concepts, especially in ecohydrology fescue dry and semi-arid regions, leading to theoretical concepts presented in the form and implementation of projects will be applied. Therefore, studies in pastures as ecohydrology broadest and most complex ecosystems soil showed New Approach in the management of water resources.

Filiz Kucuksezgin
Professor, Dokuz Eylul University, Turkey.

Evaluation of Organochlorine Pesticide Residues in Sediments from Gediz and Bakırçay Rivers, Eastern Aegean

The contamination of organochlorine pesticides (OCPs) in sediments from Gediz and Bakırçay Rivers were investigated to evaluate the pollution potentials and distribution of OCPs in western Turkey. In the selected rivers, the rapidly developing industrial and agricultural activities, municipal development and use of chemicals caused serious environmental problems. Surface sediments were sampled on January (rainy season) and July 2004 (dry season) at sampling stations from Gediz and Bakırçay Rivers. The concentrations of OCPs, by high resolution gas chromatography-electron capture detector, were detected in the sediment samples from the rivers that flow into the Aegean Sea. The concentration of organochlorine pesticides in surficial sediments from Gediz River were 0.88-47.4 $ngg^{-1}dw$ for Σ DDTs; 0.04-2.0 for Σ HCHs and 0.34-7.5 $ngg^{-1}dw$ for Σ Cyclodienes. Results showed that the concentrations of pesticides in sediments were in the range of 3.2-45.9 $ngg^{-1}dw$ for Σ DDT; 0.43-2.0 $ngg^{-1}dw$ for Σ HCH and 0.78-8.6 $ngg^{-1}dw$ for Σ Cyclodienes in Bakırçay River. Among the OCPs, 4,4'-DDE was the most dominant compound in the Gediz and Bakırçay River sediments during rainy and dry seasons. In this study; the ratios of DDD+DDE/ΣDDT and DDD/DDE were used to indicate the most probable source of contamination. The result of these ratios showed that the most of the contamination by organochlorinated pesticides comes from the weathered agricultural areas. The ratios of DDD/DDE for the sediment samples were smaller than unity. This means that DDE was the most frequent OCP in the river sediments.

Noushad Kunnummal
Engineering Consultant, Saudi Aramco, Saudi Arabia.
Osama I. Fageeha
Saudi Aramco, Saudi Arabia.
Seraj Al-Ghamdi
Saudi Aramco, Saudi Arabia.
Ahmed A. Basfar
King Abdulaziz City of Science and Technology, Saudi Arabia.
Andrzej G. Chmielewski
Institute of Nuclear Chemistry and Technology, Poland.
Andrzej Pawelec
Institute of Nuclear Chemistry and Technology, Poland.
Bogdan Tyminski
Institute of Nuclear Chemistry and Technology, Poland.
Zbigniew Zimek
Institute of Nuclear Chemistry and Technology, Poland.
Janusz Licki
Institute of Atomic Energy, Poland.

Electron Beam Flue Gas Treatment (EBFGT) Technology for Simultaneous Removal of SO2 and NOx from Combustion of Liquid Fuels

The electron beam technology was applied for removal of SO_2 and NO_x from flue gas, emitted from combustion of high-sulfur Arabian fuels. The detailed study of this process was performed in a laboratory by irradiating the exhaust gas from the combustion of three grades of Arabian fuels with an electron beam accelerator (800 keV, 20 kW). The SO_2 removal is mainly dependent on ammonia stoichiometry and flue gas temperature and humidity, for electron beam irradiation doses up to 8kGy. On the other hand, NO_x removal depends primarily on irradiation dose; gas temperature and ammonia stoichiometry have only secondary effects. High removal efficiencies up to 98% for SO_2 and up to 82% for NO_x were obtained under optimal conditions. The flue gas emitted from combustion of high-sulfur fuel oils, after electron beam irradiation, meets the U.S. EPA and other regulatory agencies' emission standards for both pollutants. The by-product, which is a mixture of ammonium sulfate and nitrate, can be used as a fertilizer as such or blended with other components to produce commercial agricultural fertilizer.

Angeliki Laiou
Ph.D. Student, University of Tuscia, Italy.
V. Vinciguerra
University of Tuscia, Italy.
M. C. Simeone
University of Tuscia, Italy.
R. Bellarosa
University of Tuscia, Italy.
B. Schirone
University of Tuscia, Italy.

Geographical and Seasonal Variation of Taxol Content in the Needles of *Taxus Baccata L.* Estimated by High Pressure Liquid Chromatography (HPLC)

Yews have been known for their toxicity to humans and domesticated animals and have been making medicinal headlines, as they provide diterpenoid anticancer compounds such as paclitaxel. Paclitaxel or Taxol (marketed in France as Taxol® since 1994) contributes to the treatment of various forms of cancer like ovarian and breast[1]. It has been isolated both from the bark and needles of Taxus spp but is found only in traces. Thus the compound cannot be produced on an industrial scale without eventually destroying the species. Systematically, this research was to screen the different provenances of Yews, more specifically, of *Taxus baccata* L. for the quantity of paclitaxel in relation to season variation. Needles were extracted with a solution of 96% EtOH, H20 and AcOH and dried at reduced pressure[2]. The solid was redissolved with a small amount of methanol and directly analyzed by HPLC. The objective of the present study was the elucidation of the effect of vegetative period, sex and provenance on the Taxol content from the needles of Yew tree. A considerable variation has been found between the different European provenances (Atlantic and Mediterranean) as well as within the natural population of *T. baccata* L. trees growing in Italy in relation to different sex. The highest quantity of Taxol was found in Azores while the lowest in an Italian field.

[1]M.Markman, Yale J.Biol.Med, 64 (1991) 583
[2]Erik L.M van Rozendaal, Gerrit P. Lelyveld, Teris A.van Beek, J.Phytochemical Analysis,8 (1997) 286

Carolina Lazaro
Ph.D. Student, University of Sao Paolo, Brazil.
R. B. de Moura
University of Sao Paulo, Brazil.
S. I. Maintinguer
University of Sao Paulo, Brazil.
I. K. Sakamoto
University of Sao Paulo, Brazil.
M. B. A. Varesche
University of Sao Paulo, Brazil.

Fermentative Hydrogen Production Using Sugar-Cane Vinasse as Subtrate

New energy fuel sources have been extensively studied. The hydrogen gas has gained advantages because it is considered a clean energy source that can be produced by microorganisms which uses organic compounds present in wastewater to grow and produce H2. The aim of this study was to enrich a microbial consortium able to grow and produce H2 from sugar-cane vinasse carbohydrates. The vinasse is mainly wastewater produced in the ethanol industry in Brazil. It is potentially pollutant because its high COD, low pH, presence of heavy metals and solids. The inoculum used was UASB mesophilic sludge that was before heat treated. The biomass was adapted in culture medium with diluted vinasse to the final concentration of 2 g COD/L. After the biomass enrichment period it was used for the assays of hydrogen production. Three different concentrations of vinasse were tested: 2; 5 e 8 g COD/L. The culture medium was composed by diluted vinasse in ultrapure water supplemented with salt solutions. The initial pH was adjusted to 5.5 with NaOH. The assays were carried out in batch reactors with total volume of 2 L, working volume of 1.2 L and 0.8 L of headspace filled with N2. The reactors were kept in temperature controlled chamber at 37°C and 55°C. The hydrogen gas, volatile acids and etanol were measured by gas chromatographic. The carbohydrate consumption was quantified by colorimetric method. The consortium enriched was able to produce hydrogen using a carbohydrate present in sugar-cane vinasse as a sole substrate for all the vinasse concentrations. The microscopic analysis showed the predominance of rods in the enriched consortia. DGGE analysis showed the selection of populations among sludge, mesophilic and thermophilic consortium. As a future perspective, the DGGE bands will be sequenced to identify the microorganisms present in the consortia.

Jin-Hong Lee
Professor, Chungnam National University, Republic of Korea.
Ki-Hyun Kim, Jin-Hee Jeong, Byoung-Won Jung
Chungnam National University, Republic of Korea.
Jong-Myoung Lim, Jong-Wha Moon, Yong-Sam Chung
Korea Atomic Energy Research Institute, Republic of Korea.
Ki-Hyun Kim
Sejong University, Republic of Korea.

Characteristics of Trace Elements in Indoor PM2.5 at a Subway Station in Korea

PM with aerodynamic diameter equivalent to or less than 2.5 μm (PM2.5) can be deposited in the lower respiratory tract, because of its ability to penetrate upper airways of the human respiratory tract. Deeply deposited PM2.5 is removed very slowly with more chances to damage healthy cells. Quantitative information on PM2.5 can provide valuable information on diverse types of respiratory health risks. The contaminants originated from the indoor pollution sources as well as various outdoor sources are easily accumulated in indoor environment dissimilar to the outdoor. Especially, since natural ventilation is nearly impossible in subway station, its pollution status can be worsened under the circumstance that contaminants are constantly originated and circulated inside of station by the repetitive action of subway trains. In this study, a total of 60 PM2.5 samples were collected during 4 seasonal campaigns in 2009 with a low-volume air sampler at one subway station in Daejeon, Korea. We undertook the measurements of up to 25 elements in PM2.5 using instrumental neutron activation analysis (INAA) and X-ray fluorescence (XRF). The PM2.5 concentrations in the subway station varied in the range of 16.1 to 72.7 μg m^{-3} with average (± standard deviation) of 36.9 ± 12.4 μg m^{-3}. The concentrations of As, Cr, Mn, and Zn in PM2.5 averaged as 1.63 ± 0.87, 25.5 ± 11.7, 175.5 ± 38.3, and 135.4 ± 51.6 ng m^{-3}, respectively. The Fe concentrations in PM2.5 varied in the range of 0.7 to 16.0 μg m^{-3} with average (± standard deviation) of 8.1 ± 8.9 μg m^{-3}. The Fe concentrations in the PM2.5 were apportioned by about 22% to show that they were substantially higher than all other elements.

Chan-Chao Lin
Student, National Cheng Kung University, Taiwan.
Y. H. Chen
National Cheng Kung University, Taiwan.

Synthesis, Characterization and Photocatalysis of Iron Oxide Nanotubes

In recent years, environmental issues have become increasingly more important. Photocatalysis is an environmentally friendly process that utilizes irradiation energy to perform catalytic reactions. Thus, photocatalysis technology has been widely investigated for pollutant eradication. Iron oxide minerals are very common materials in the nature world and they also have great potential in using as photocatalysts under visible-light irradiation.

In this study, the iron oxide (hematite, magnetite, and maghemite) nanotubes are synthesized by the hydrothermal methods. After preparation the nanotube, the crystal structure is characterized by X-ray powder diffraction, and the morphology and grain size are observed by transmission electron microscopy. For determining the specific surface area, the nitrogen gas adsorption method is used. The bandgap is measured from the UV-Vis diffuse reflectance spectrum. In the photocatalysis experiment, the degradation of methylene blue is measured under the Vis-light irradiation in a black box. The photocatalytic activity of different kinds of iron oxide nanotubes will be studied, and experiments will be conducted to investigate the kinetics of the decomposition reaction.

Hossein Maazallahi
BSc Student, Sharif University of Technology, Iran.
Mehdi Zolfaghari
M.SC. Student, Sharif University of Technology, Iran.
Manouchehr Vosoughi
Professor, Sharif University of Technology, Iran.
Iran Alemzahdeh
Professor, Sharif University of Technology, Iran.

Oily Wastewater Treatment by a Novel Fixed-Film Baffled Bioreactor

Oil refineries, petrochemical factories and oil platforms produce a large amount of oily wastewater every day. Although, tradition biological treatment plants of oily wastewaters is a well-established method for remediation of these wastes, there are many problem associate with conventional systems such as Activated Sludge. We have designed a new bioreactor system to increase the efficiency of treatment by allowing greater organic loads, changing the reactor configuration, increasing microbial concentration by using attached and suspended bacteria, and increasing stability and resistance to hydraulic and organic shocks. Novel media used in this Fixed-Film bioreactor provides a high surface area-to-volume ratio (600 m^2/m^3) which increases MLSS in the reactor.

Reactor Biodegradability for COD (Chemical Oxygen Demand) and

Sandra Maintinguer
Professor, University of Sao Paolo, Brazil.
C. Z. Lazaro
Ph.D. Student, University of Sao Paolo, Brazil.
I. K. Sakamonto
Professor, University of Sao Paolo, Brazil.
M. B. A. Varesche
Professor, University of Sao Paolo, Brazil.

Hydrogen Biologic Production from Environmental Sample in Tropical Countries

Inoculum sources have been successfully tested for hydrogen biological production in as sludge treatment plants sewage, sludge treatment plant wastewater and landfill sample. Hydrogen biologic production with inoculum from environmental samples, in tropical countries like Brazil, is rarely investigated. Fresh water lake sediment may contain conditions for the survival of a wide variety of microorganisms which use different carbon sources mainly glucose and xylose. Glucose is an easily biodegradable, present in most of the industrial effluents and can be obtained abundantly from agricultural wastes. Variety of wastewater resulting from agriculture, industry and pulp and paper processed from wood may contain xylose in its constitution. Such effluent contains glucose and xylose concentrations of about 2 g/L.

This work verified hydrogen biological production in anaerobic batch reactor (1L), at 37 ° C, initial pH 5.5, headspace N_2 (100%), fed separately with glucose (2g/L) and xylose (2 g/L). Inoculum was taken from environmental sample (sediment reservoir Itupararanga - Ibiúna - SP-Brazil). It was previously purified in serial dilutions, heat treated (90^{o}C - 10 min) later to inhibited the H_2 consumers. Reactors fed with glucose and xylose were observed maximum H_2 generations at 552 h, respectively, 9.1 and 8.6 mmol H_2/L, biomass growth (0.2 and 0.2 $_{abs600}$); consumption of sugar concentrations (glucose 53.6% and xylose 90.5%); acetic acid generation (124.7 and 82.7 mg/L), butyric acid (134.0 and 230.4 mg/L) and there wasn't methane generation. Biomass morphology showed the predominance of Gram positive rods and rods with endospores; that's its characteristic of H_2-generating bacteria, in both tests. Efficiency of inoculum pre-treatment and pH 5.5 inhibited methane-producing microorganisms and H_2 consumers. Experimental conditions imposed allowed the attainment of bacterial consortium of producer H_2 taken from an environmental sample with concentration of xylose and glucose similar to the ones of the industrial effluents.

Ignacio Ramiro Martin-Dominguez
Researcher, Advanced Materials Research Center, Mexico.
J. A. Burciaga-Santos
Researcher, Advanced Materials Research Center, Mexico.
P. E. Castro-Lopez
Researcher, Advanced Materials Research Center, Mexico.
M. T. Alarcon-Herrera
Researcher, Advanced Materials Research Center, Mexico.

TRNSYS Simulation and Optimization of a Solar-Thermal Collection and Storage System for the Heating of Agricultural Greenhouses

In the semi-desertic plateau of northern Mexico, ambient temperature varies significantly between day and night due to the fact that low ambient humidity causes heavy radiative heat losses to the atmosphere. Searing summers are followed by freezing winters, all of which makes the use of greenhouses essential. There is no other way to control the conditions needed to grow the food supply required by the growing local population.

Climate control represents the primary energy expenditure of greenhouse operation. Temperature and humidity must be kept within narrow margins, in order for the crops to develop properly throughout the year and reach the production volumes that make the whole enterprise profitable. Until now, heating based on fossil fuels was the only option available to the local growers. Many family-owned agricultural businesses have failed in the last few years due to increases in fuel prices and farmers' inability to anticipate the profitability of particular greenhouse designs, crops, and regions.

This work presents a computational simulator created to estimate the behavior of a greenhouse fitted with a solar-thermal collection system and an auxiliary propane-butane (LPG) heating system. The simulator enables parametric studies on the following variables: size and design of the greenhouse, construction materials, crop, geographic location (climate) of the site, type and number of solar collectors, thermal storage volume, and type of temperature control. The simulator calculates the energy consumption in the auxiliary heater needed to keep the temperature and humidity of the greenhouse within the established limits. The simulator was developed using TRNSYS (Transient Energy Systems Simulation Tool). For a given set of parametric values, the program analyzes a year of operation and simulates the operation of the system at 10-minute intervals. Energy expenditures are summed throughout the year of operation, producing yearly totals that can be compared with the results from different

parametric combinations. We present an economic analysis that considers a project life of 10 years, the cost of the solar collection system, thermal storage, and auxiliary heater, as well as the cost of LPG and inflation. Our analysis shows how to reach an optimal design of the heating system that will minimize fuel costs.

Young Sun Mok
Professor, Jeju National University, South Korea.
Eunjin Jwa
Jeju National University, South Korea.

Effect of Nickel Loading and Support Material on Plasma-Catalytic Methanation of CO over Nickel Supported Catalysts

The gradual depletion of petroleum has increased concern over coal technologies. Since coal reserves are expected to last for more than 230 years, it will play an important role in the future energy scenario. Methane is one of the most important carbon resources, serving as energy and a feedstock for higher-value chemicals. Therefore, there is renewed interest in synthesizing methane from coal. Production of methane from coal consists of several steps. The first step is the gasification of coal using steam reforming and partial oxidation to produce synthesis gas, a gas mixture comprising primarily of carbon monoxide (CO) and hydrogen (H_2). The conversion of the synthesis gas to methane is a crucial part of the process. After removing undesired compounds and adjusting the CO/H_2 molar ratio, the synthesis gas is fed to a catalytic reactor where it is converted into methane over a suitable catalyst under appropriate reaction conditions.

In the present work, an experimental investigation has been conducted to study the combination of nonthermal plasma and catalysis for the methanation of the synthesis gas. The methanation was performed over a Ni/alumina catalyst prepared by incipient wetness impregnation method, which was placed in the discharge area of the nonthermal plasma reactor. A cylindrical dielectric barrier discharge (DBD) reactor was employed as the plasma reactor. The present work focused on the effect of nickel loading (0~10wt%) and support materials (alumina and zeolite) on the methanation rate. The reaction temperature was varied in the range up to 320^oC at various applied voltages of 6~10 kV. The molar ratio of H_2/CO was fixed at 3.0. It was found that the nonthermal plasma significantly enhanced the conversion of CO, giving higher conversion efficiencies at higher voltages. There was an optimal nickel content (about 5wt% Ni) where the plasma effect was maximized. The behavior of the methanation in the plasma-catalytic reactor somewhat depended on the support type, but it was not significant. The reaction products identified by Fourier transform infrared (FTIR) spectra and gas chromatogram were CH_4, CO_2 and H_2O, which showed that CO was converted primarily into CH_4 with high selectivity above 98% at most experimental conditions.

Bruna S. Moraes
Ph.D. Student, University of Sao Paulo, Brazil.
Eugenio Foresti
University of Sao Paulo, Brazil.

Intrinsic Kinetics of Autotrophic Denitrification using Sulfide as Electron Donor in Systems with Immobilized Biomass

Nitrogen removal coupled to sulfide oxidation has great potential for treatment of effluents from anaerobic reactors since they are rich in ammonium-nitrogen, which can be nitrified, and soluble/gaseous sulfide, which can be used as an endogenous electron donor. Thus, autotrophic denitrification is an advantageous alternative over conventional heterotrophic denitrification, eliminating the addition of external carbon source and reducing costs related to terciary treatment. The denitrification via nitrite is another conception economically interesting since there is less oxygen and alcalinity consumption for nitrification and also the possibility of simultaneous nitrification/denitrification in the same reactor. This research investigated fundamental aspects of sulfide-oxidizing autotrophic denitrification via nitrate and via nitrite since gaps in literature are notably significant regarding its intrinsic kinetics. Differentialhorizontal reactors were used, containing immobilized biomass on polyurethane-foam cubes, which was previously adapted to the process in vertical-flow reactors. The reactors were fed with nitrified synthetic domestic sewage and different concentrations of sulfide, resulting in different N/S molar ratios. Kinetic modelling for N-removal was conducted from profiles of specific nitrogen concentration in nitrate and nitrite forms over time. Complete sulfide oxidation occurred in two steps: sulfide was converted to sulfur intermediates, and finally to sulfate. The N/S molar ratio influenced the final products of sulfide oxidation and the excess of sulphide increased the sulfur intermediates formation. The intrinsic kinetics of this bioprocess followed zero-order models in all tested conditions, i.e., the biochemical reactions rates were not affected by substrate concentrations. Higher rates were obtained when electrons were donated directly by sulfide, compared to the sulfur intermediates, e.g. elemental sulfur. The specific N-removal rate via nitrate was slightly higher than via nitrite, whereas most of the electrons were donated directly by sulfide. The average N-removal rates were 1.38+0.17 to 3,80+0,18mgN.gVSS-1.h-1 and 2.25+0.39 to 3.19+0.52mgN.gVSS-1.h-1 for denitrification from nitrate and from nitrite, respectively.

Leandro Oliveira
Associate Professor, Federal University of Minas Gerais, Brazil.
Adriana S. Franca
Associate Professor, Federal University of Minas Gerais, Brazil.
Luis Carlos Oliveira Silva
Federal University of Minas Gerais, Brazil.

Development of an Adsorbent Based on Spent Coffee Grounds for Wastewater Treatment – 2: Fixed-Bed Adsorption Studies

The treatment of high volumes of wastewater containing low concentrations of pollutants is of increasingly relevance as the awareness regarding the pollutants negative effects on human health and on the environment has led discharge regulations to become more stringent. Adsorption, as a unit operation for removing pollutants from effluents, has gained increasing popularity in recent years, because the process produces a high quality treated effluent, which can meet stringent environmental emission standards. Adsorption processes for purification of wastewaters can be carried out either discontinuously, in batch reactors, or continuously, in fixed-bed adsorbers (columns). Batch reactors are easier to operate than fixed-bed columns in laboratory studies, but are less convenient for industrial applications because discontinuous feeding is less economic than continuous feeding. Thus, the objective of the present study was to evaluate the performance of an adsorbent based on spent coffee grounds (SCG) for wastewater treatment, specifically for phenol removal. The SCG were submitted to chemical activation with potassium hydroxide (KOH at 8 mol L^{-1}, 3 h under sonication at 60 °C). Continuous flow adsorption experiments were conducted in a cylindrical stainless steel column (2.5 cm internal diameter and 30 cm height). At the bottom of the column, a 0.5 mm stainless sieve was attached followed by glass wool. Known quantities of adsorbent were placed into the column to yield the desired bed height of 6 cm of adsorbent. The operation of the column was halted when the phenol effluent concentration attained 99% of its inlet concentration. The effects of initial phenol concentration and flow rate were investigated. Increases in the inlet concentration and in the flow rate lead to a shortening of both the breakthrough time and the bed service time, i.e., the adsorbent was more quickly saturated. Four kinetic models, Thomas, Bohart–Adams, Yoon–Nelson and Dose-Response, were fitted to experimental data to predict the breakthrough curves. The results obtained in the present study confirm the potential of using spent coffee grounds as raw materials for production of adsorbents with application in wastewater treatment.

Gunseli Ozdemir
Associate Professor, Ege University, Turkey.
S. Kocaturk
Chemical Engineer, Turkey.

Removal of Heavy Metal Ions from Aqueous Solutions Using Modified Chicken Feathers

Environmental pollution from industrial wastewaters, that contain heavy metal ions, is an important issue in many countries of the world. The metal finishing, photography, ceramics, chemical and metallurgical industries along with mining and agricultural activities are the main sources of heavy metal loaded effluents. Several technologies have been developed for treating wastewaters. Biosorption is one of the technologies that have gained importance in recent years. Chicken feathers (CF) are among the biosorbents that can be used for heavy metal removal from polluted waters. They are composed of a fibrous protein called keratin and their advantages lie in their properties like high tensile strength, chemical stability, water insolubility in a wide pH range, and high specific surface area.

In this study, untreated and citric acid (CA) modified CFs were used as biosorbent for the removal of Cu^{2+}, Cd^{2+}, Ni^{2+}, and Zn^{2+} from their single metal ion aqueous solutions at low concentrations ($C_{initial}$=20 mg/L). Modification with CA increased the capacity of untreated CF 4 to 6 fold, which is given in decreasing order by $Cu^{2+} > Cd^{2+} \approx Ni^{2+} \approx Zn^{2+}$, as 0.1, 0.06, 0.06 and 0.058 mmol/g, respectively. Sorption equilibrium and kinetic behavior of heavy metal ions were studied using batch experiments at constant pH (Cu solutions at pH 5 and the others at pH 6) and tested for reuseability. Among the equilibrium models including the Langmuir, Dubinin-Kaganer-Radushkevich (DKR) and Freundlich isotherms, the DKR isotherm was more appropriate for the experimental data. Good correlation coefficients were obtained for the pseudo-second order kinetic model. The nature of the structural changes due to modification of CF was elucidated by ATR-FTIR and SEM analyses. The experimental results showed that CF is a low cost and promising biosorbent for the treatment of effluents polluted with low heavy metal ion concentrations.

Sun-Young Park
Ph.D. Student, Korea University, Republic of Korea.
Seung-Hoon Yoo
Graduate, Seoul NationalUniversity, Republic of Korea.
Joo-Suk Lee
Korea University, Republic of Korea.

Measuring the Conservation Value of Tidal Flat in Shinan, Korea: A Contingent Valuation Study

Until ten years ago, a tidal flat had been regarded as a useless place in Korea, however, it became a precise place to give nutrient services to nature. At the time of changing a viewpoint on tidal flat, it is meaningful to measure its conservation value. This paper attempts to measure willingness to pay for the conservation value of tidal flat in Shinan, Korea. This analysis used contingent valuation method by dichotomous choices format to estimate the conservation value of tidal flat Shinan in Korea. For many zero responses which are found in the survey, spike model, which is introduced by Kristr?m, is applied The conservation values were estimated based on the spike models using the ML estimation method. The mean value of willingness to pay for tidal flat in Shinan by Korean household is estimated at about 3,100 Korean won (GBP 1.63) per year per household and extended to total value for all household in Korea, it is about 53.17 billion KRW (GBP 28.06 million). These findings are expected to be grounds for wetland management and encourage relevant studies for the conservation value of wetlands in the world. The findings of this study provide important insights for policy. For policy purposes, the results are useful base points in understanding the possible implications of conserving tidal flats.

Ekaterina Parkhomchuk
Researcher, Boreskov Institute of Catalysis, Russia.
Kseniya Sashkina
Novosibirsk State University, Russia.

AOP's in Water Purification from Low and High Molecular Organic Contaminants

A comparison study of different advanced oxidation processes (AOPs) for water treatment containing organic contaminants will be presented. Such AOPs as homogeneous and heterogeneous Fenton reactions have been tested in total oxidation of low molecular contaminants: organic acids, alcohols, ketones, amines and aromatic substances.

A special attention was paid to the heterogeneous Fenton system, namely Fe-containing zeolite/H_2O_2. Adsorption properties of the heterogeneous system with respect to low and high molecular organics have been studied. Heterogeneity of the Fe-catalytic sites in the zeolite appeared to result in a more effective use of the hydrogen peroxide and a deeper oxidation of a substrate as compared to homogeneous Fenton system. Furthermore zeolitic catalyst developed was active in a wide pH range, did not contaminate the solution by transition metal ions and did not lose its activity in a presence of complexing agents. The analysis of by-products during the oxidative water treating has been made.

Contrasting the low-molecular organic contaminants, the oxidation of lignin in aqueous solutions was drastically slowed down in presence of heterogeneous Fenton system, showing the superior performance of acidic homogeneous Fenton and hydrogen peroxide UV-photolysis. This was explained by steric hindrance in oxidation of lignin with OH radicals on the catalyst surface and possible deactivation of lignin molecules adsorbed on the zeolite. Under acidic media conditions, UV-assisted heterogeneous Fenton treatment showed the performance close to the one of H_2O_2/UV oxidation.

An attempt to increase the efficiency of high molecular organic contaminants oxidation by heterogeneous Fenton system was taken using macroporous Fe-containing zeolite as a catalyst. The last one was produced by templating silicates with zeolitic microporous framework on to polymeric matrix. The results on choice of the synthesis conditions and the catalytic experiments will be presented.

Idil Pazi
Professor, Dokuz Eydul University, Turkey.
Guzel Yuccl-Gier
Professor, Dokuz Eydul University, Turkey.
Filiz Kucuksezgin
Professor, Dokuz Eydul University, Turkey.
Ferah Kocak
Professor, Dokuz Eydul University, Turkey.

Investigation of TRIX in the Regulation of the Turkish Marine Aquaculture: Application to the Eastern Aegean Coastal Water (Izmir Bay)

Coastal aquaculture is widespread in Turkey and there is a need for proper coastal space management among the different users of the coastal zone. In Turkey, an Environmental Impact Assessment is a legal requirement for any marine aquaculture development. A new legislation was enacted about "Rearrangement of establishing fish farms in the closed bay and gulf qualified sensitive areas due to recent criteria in 2007" by the Ministry of Environmental and Forestry of Turkey. The objective of this study is to emphasize and review the environmental laws related to the TRIX, which can be counted as recent criteria for marine aquaculture activity in the Izmir Bay. The seasonal mean value of TRIX was 2.5 in the Outer Bay. In the Inner Bay, mean TRIX value (4.3) which is above the threshold of four and typical for high eutrophication risk areas. Inner Bay become very productive (eutrophic) and it is sensitive to eutrophication phenomena during the year. The trophic status of the aquaculture area (mean TRIX: 3.6) indicates no risk of eutrophication as defined by Turkish law. The study then applied the UNTRIX indices adjusted to local conditions, revealing that both the inner bay and the aquaculture area (AA) can be classified as of poor status whereas the outer bay can be defined as good. The UNTRIX-based trophic classification is in good agreement with TRIX for both the outer and inner parts of the bay; however, there is no agreement regarding the classification of the aquaculture area.

Gustavo Pizarro Lopes
Master Student, University of Porto, Portugal.
MCM Alvim-Ferraz, M. F. Almeida, J. M. Dias, F. G.Martins, J. C. Pires
University of Porto, Portugal.

Modelling Viscosity of Raw Materials for Biodiesel Production

Biodiesel is an alternative fuel to fossil diesel, its use contributing to diversify energetic sources as well as to reduce green house gas emissions. It is renewable, being produced from triglycerides such as vegetable oils and animal fats. As vegetable oils compete with the food market for the use of the soil, new raw materials need to be developed aiming biodiesel production. The use of waste oils has showed to be very promising. Considering that biodiesel quality must obey international standards and that it strongly depends on raw material characteristics, their determination must be performed efficiently, which means accurately through quick and inexpensive processes. Therefore, the development to predict raw material characteristics is of undeniable interest. The main objective of this work was to develop an efficient process to predict the dynamic viscosity of different raw materials as a function of temperature (T). For that, a mathematical model was developed based on a training set including experiences for three different oils at five different temperatures ranging from 30 ^{o}C to 90 ^{o}C. Density and kinematic viscosity were determined to calculate dynamic viscosity.

The results obtained through the training set obeyed a model with determination coefficients ranging from 0.9978 to 0.9983. The performance of the model was evaluated comparing the model results with those obtained through a validation set including experiences for the three different oils at three different temperatures, including one (95 ^{o}C) out of the training set range. The determination coefficients for the validation set were also evaluated.

The results showed that the values obtained at the validation set were very similar to those obtained by simulation through the model. The determination coefficients for the validation set were also very good which means that the developed model was adequate to predict the viscosity of the raw materials analysed.

Jeffrey M. Plumblee
NSF Graduate Research Fellow, Clemson University, USA.
Jacqualyn Blizzard
NSF Graduate Research Fellow, Clemson University, USA.
Leidy Klotz
NSF Graduate Research Fellow,Clemson University, USA.

Integrating Disaster Risk into the Life-Cycle Assessment Framework

In traditional life-cycle assessment (LCA) methods, there is not a well defined method for analyzing the potential benefits gained from resilience. This research will define a framework for including effects of disaster related failure and associated secondary damages into the comparative life-cycle assessment process.

The framework will be designed such that individuals can perform a low cost and quick comparative LCA of resilient and traditional construction products using risk-related probabilities and the Economic Input-Output Life Cycle Assessment, developed by Carnegie Mellon University's Green Design Institute.

The process will be run through a pilot test comparing different materials and products. The results of these pilot tests will be compared to results from process-based LCA methods for validation purposes.

The integration of risk into the LCA process will include the following variables:

- Disaster occurrence probability
- Product failure probabilities
- Secondary damage probabilities and associated costs

The proposed framework for inclusion of disaster risk into life-cycle assessment and preliminary results from the pilot tests will be presented.

Regiane Priscila Ratti Sartori
Professor, University of Sao Paulo, Brazil.
L. S. Botta
Professor, University of Sao Paulo, Brazil.
I.K. Sakamoto
Professor, University of Sao Paulo, Brazil.
S. I. Maintinguer
Professor, University of Sao Paulo, Brazil.
C. Z. Lazaro
Professor, University of Sao Paulo, Brazil
M. B. A. Varesche
Professor, University of Sao Paulo, Brazil.

Comparison of Different Pretreatment Methods for Enriching Hydrogen Producing Bacteria from Cellulose Digestion by Ruminal Fluid Microflora

Recently, the conversion of cellulose to hydrogen has attracted attention as a means of biological hydrogen production. The present study aimed to investigate the efficiency of different pretreatment methods on ruminal fluid in a modificated Del Nery medium (DNM) in order to enrich H_2 producing bacteria consortia to enhance biohydrogen rate and substrate removal efficiency. Ruminal fluid was taken to three different pretreatments: acid, base and aeration. The experiments were conducted under anaerobic conditions at 37°C and initial pH 7.0 using rumen fluid (10% v/v) as inoculum. The H_2 gas and the volatile acids (VAs) generated during experiments were measured by a gas chromatograph (Shimadzu GC 2010). Cellulose in culture fluids was quantified by using the anthrone-sulfuric acid method. To increase cellulose degradation it will be added cellulase enzyme to the medium. Analysis showed that the biogas produced from the anaerobic fermentation contained only hydrogen and carbon dioxide, without detectable methane on acid pretreatment test. The hydrogen production started after 144 h (19 mmol H_2/L) of incubation, when it was observed the maximum H_2 concentration in biogas. The base treatment was efficient to inhibit methanogenic archaea cells and the.production of hydrogen was detected after 24h of incubation (17 mmol H_2/L). Aeration was not efficient to inhibit methanogenic archea since there was observed methane gas after 144h of incubation. In the VAs analyses there were found acetate, butyrate and propionate. On microscopy analyses there were observed rods with endospores and a predominance of cocus. The batch anaerobic fermentation assays performed on anaerobic mixed inoculum from rumen fluid demonstrated the feasibility of H_2 generation utilizing cellulose as

substrate. Based on the results, it can be concluded that the acid treatment was the most efficient to inhibit the methanogenic archaea cells present in rumen fluid and to produce H_2.

Douglas Rezende
Student, Campinas Anhanguera Faculty, Brazil.
Paulo R. Santos
Professor, Campinas Anhanguera Faculty, Brazil.
Carlos A. Mariotoni
Professor, Campinas Anhanguera Faculty, Brazil.

Highlights of the Studies for the Use of Landfills for Power Generation in Brazil

Brazil, Russia, India and China form together the BRIC: a group of countries that currently has the highest rates of economic development in the world. It is expected a very strong economic growth in those countries in the beginning decade. Some specialists believe this growth will be able to make changes in global economy. The Brazilian annual rate of economic growth is being between 4 and 6%, since 2000. To support this growth, Brazil needs additions of about 4000 MW per year in the electric energy matrix, with investments of U.S. $ 56 billion by 2015 in generation and transmission. The country has the highest water potential in the world, so the construction of hydroelectric power plants is proving to be the best solution for the steady increase of support that load. But this alternative has environmental negative effects such as the diversion of the rivers, flooding of native green areas, impacts on the local fauna and flora. In the social field can be pointed the removing of families of the flooded the areas in future, and wide intervals between the stages of planning, environmental approval, construction and operation of these power plants. Power generation through biomass, natural gas and methane gas, has been prominent among alternative energy research and renewable sources, with low costs and satisfactory levels of pollution, to help the National Energy Matrix. This paper highlights the importance of the process of exploitation of methane gas produced in landfills for power generation in Brazil. To do so, presents the average characteristics of the Brazilian landfills in terms of composition, terms of use and operation. It also highlights the need for development of culture and public policy to allow use of the potential of Brazil. As a result, shows the possibilities to gain carbon credits, improving the quality of life in the area of the landfill and mainly, how much this clean energy can help the National Energy Matrix through the Distributed Generation.

Abraham Rojano
Professor, Universidad Autónoma Chapingo, Mexico.

Phase Diagrams in Agricultural Engineering

The main objective of this paper is to show the total energy found in controlled agriculture as a function of its components under different conditions located in México. The strong differences of heat capacity between dry air and vapor makes feasible to storage a significant amount of energy as temperature increases. Since rational knowledge of the laws of the nature and the technological limitations requires knowing the role temperature and humidity, thus the enthalpy with three different diagrams alike: T-H diagram, Mollier and Carrier diagrams in a 2D framework. As a result, decisions to handle an intensive agricultural system inside the ideal levels of production are suggested.

Raquel Salazar
Professor, Universidad Autónoma Chapingo, Mexico.
Ferenc Szidarovsky
Systems and Industrial Engineering Department, University of Arizona, Tucson, USA.
Jazmin Zatarain
Cologne University of Applied Sciences, Cologne Germany.
Abraham Rojano
Universidad Autónoma Chapingo, Mexico.

Optimal Water Distribution Scenarios Using Two Approaches

This paper provides an overview of the water supply problems in Mexico City and its Metropolitan area, this region heading towards a major water crisis, more than 30% of its water supply comes from external sources. The demand for water exceeds the sustainable yield of aquifers and rivers, groundwater sources are overexploited between 9-12 m^3/s generating 6-28 cm of sinking every year. The gap between the continuously growing use of water and the sustainable supply is widening each year, making the water supply more and more difficult. The amount of subsidy given by the government is 34% of the total National Water Commission budget, and it is expected to increase in the next few years.

A Multiobjective Optimization Models are developed to find the most satisfying water distribution strategy in this region. Four objective functions are considered: minimize water shortages of agriculture, industry, and domestic users and the subsidy paid by the National Water Commission. Also, 14 constraints are included which take into account five sources of water supply and environmental issues. Distance based methods with the L_1 and L_∞ distances were applied in order to reflect the extreme cases of possible compensation among the objectives. The application of the L_1 distance requires the application of the simplex method. In the case of the L_∞ distance, the nondifferentiable objective function can be transformed into a linear objective by adding linear constraints to the original constraints of the problem. Therefore, this case also could be solved by the simplex method. Ten water distribution scenarios were computed by two multiobjective methods. In both models , the problem is how to allocate this scarce resource among competing users, the final decision scenario will depend on the state water utility that needs to balance the consequences of each action.

Ibrahim Salem
Professor, Tanta University, Egypt.
Ahmed B.Zaki
Tanta University, Egypt.
Ali H. Gemeay
Tanta University, Egypt.
Gehad R. Eigharabawy
Tanta University, Egypt.

The Role of Polyaniline/Silica-Alumina Composites in the Decolorization of Some Organic Pollutants. A Model for Waste Water Treatment

This work is concerned with the chemical preparation and characterization of polyaniline / silica - alumina composites and studying their catalytic activity towards the decolorization of some dyes such as Eosine Y, Erythrosine B, Acid blue 129, Direct yellow 12 and Acid red 37. Since, the industrial wastewater streams may contain large amount of these dyes as pollutants, the untreated streams are practically objectionable if discharged into open water. It was found that addition of PANI/Si-Al composite to the dye solution led to the decolorization of the substrate. The rate of decolorization reaction was obviously affected by two main factors, the synthesis conditions of the composites, and the conditions of kinetic measurements for the composite /substrate interaction. The composite prepared at high concentration of $FeCl_3.6H_2O$ gave the highest decolorization rate. The reaction rate decreased with increasing [H_2SO_4] added to the polymerization bath, as well as with increasing the [Aniline] concentration and the polymerization time. The composites responsible for high decolorization rate are those prepared with [aniline] 0.21M, [$FeCl_3$. $6H_2O$] 0.4 M, [H_2SO_4] 1.0 M and polymerization time 24 h. The composite synthesized in the presence of HNO_3 is more efficient compared with those synthesized with HCl, and H_2SO_4. On the other hand, the reaction rate increased with increasing the dye concentration reaching a maximum value then decreased at high dye concentration. This is because at high concentration of the dye more molecules would diffuse into the active centers on the composite surface and render the reaction less facile. At low pH, higher decolorization rate was observed. In addition to the high stability of PANI composites, they are benign and have ecofriendly nature.

Mohammad Hossein Sarrafzadeh
Assistant Professor, University of Tehran, Iran.
Masoumeh Zargar
University of Tehran, Iran.
Bahram Taheri
Amirkabir University of Technology, Iran.
Omid Tavakoli
University of Tehran, Iran.

An Inquiry on the Environmental Aspects of Oil Contamination of Soil and Groundwater by Industry: Surveying and Cleaning Methods

Soil and water along with air, are important constituent of environment. These have an important role for survival of living organism, and material recycle. Soil and groundwater pollution usually happens locally and sometimes it is difficult to detect it. In the target area of this survey which is an industrial area near Tehran, the existence of soil and groundwater pollution was obvious. However, its source, contaminated area and distribution of pollution were not clear and need to be scrutinized more. The main purposes of this survey were to verify the presence of oil pollution in the zone and determine its ingredients, domain, sources and also its movement pattern. Besides, assessment of bioremediation method for treatment of the area was performed. In order to estimate the extent of pollution, oil thickness inside the wells and its fluctuation were measured. Also, by examination of the free oil extracted from wells, the sources could be estimated. The investigations showed that the contamination of soil is expanded until the surface of region groundwater and formed an oily layer with average thickness of about 4 meter. According to the result of free product analysis, the free product is a multi-type mixture of oil and its main ingredients are assumed to be gasoline, kerosene, and gas oil. In addition, pollution sources in the field are thought to be underground pipes, tanks, pipeline and so on. As bioremediation is one of the most economically and technically attractive ways among different remediation methods, investigations on soil column treatment by indigenous microorganisms as an applicable method for bioremediation of capillary fringe of groundwater was performed. Consequently, based on specific conditions of the explored area and remediation investigations, choosing one or combination of different remediation methods for decontaminating of the zone will be more feasible.

Harinder Singh
Professor, Grand Valley State University, USA.
Paul Isely
Grand Valley State University, USA.

Full Benefits of Green Energy Policy in Michigan

Job losses in the manufacturing sector and the pressure to adopt green policies are recurring trends in industrial economies. This paper demonstrates by a detailed case study that manufacturing economies can take advantage of these two trends by developing a long term sustainable economic strategy. We use the case of Michigan to demonstrate the argument because it is a typical manufacturing economy that is going through tough economic times with high unemployment and a manufacturing sector that is challenged by the falling profits of U.S. auto manufacturers. The case study approach is useful to provide a basic context and specific numbers to support the arguments. The objective is to eschew general arguments and be very specific about the projected costs and benefits. The direct and indirect costs\benefits of an ambitious RPS mandate and efficiency policies are evaluated. The policy framework that is needed to successfully implement the RPS mandate is analyzed.

Somdutta Singha
Researcher, Jadavpur University, India.
Ujjaini Sarkar
Jadavpur University, India.
Sourav Mondal
Jadavpur University, India.

Modeling Radial Diffusion in a Fixed Bed Column: Adsorption of Hexavalent Chromium from Waste Water by Activated Carbon

Scientific research established intense impact of chromium on human health, as it induces skin rashes, upset stomachs and ulcers, respiratory problems, kidney and liver damage, lung cancer. The feasibility of Hexavalent Chromium [Cr(VI)] removal from aqueous environment by a fixed bed column of adsorbent, with a combination of Powder Activated Carbon (PAC) and Granular Activated Carbon (GAC) in a continuous flow system has been investigated. Specifically the role of radial diffusion has been studied.

Three equilibrium isotherm models, namely, Tempkin Isotherm, Freundlich Isotherm and Langmuir Isotherm, were studied and parameterized. The dynamics of fixed-bed adsorption columns for modeling is a demanding task due to the strong nonlinearities in the equilibrium isotherms, interference effects of the competition of solutes for adsorbent sites, mass transfer resistances between fluid and solid phase and fluid-dynamic dispersion phenomena. A mathematical model has been studied for a fixed bed isothermal adsorption column with porous adsorbent. Simulations were carried out to understand the influence of radial dispersion using the above models.

The experiments were conducted to study the response of changing the diameter of the adsorbent bed with constant bed depth, flow rate and influent concentration. A mathematical model was developed based on pore diffusion and simulated to study the effect of changing diameters on the adsorption dynamics. It was observed that, the breakthrough time decreases from 540 minutes to 360 minutes as the bed diameter changes from 80 mm to 28 mm with bed volume being 123.2 cc, flow rate at 1 ml per minutes and influent concentration being 25 ppm. On the other hand, the breakthroughtime remained almost the same, about 500 minutes, for both the columns with 185 cc bed volume and other parameters remaining constant. The modeled values gave encouraging results too.

Koen Smets
Ph.D. Student, Hasselt University, Belgium.
R. Carleer
Hasselt University, Belgium.
J. Yperman
Hasselt University, Belgium.

Flash Pyrolysis of Several Different Agricultural Press Cakes: Influence of Temperature on the Yield and the Characteristics of the Pyrolysis Oil

Biomass waste is a promising source of renewable fuels and/or value-added chemicals. During the pressing of different kinds of oil crops, a solid biomass waste product is formed which is called press cake. In this study, several agricultural press cakes (like rapeseed cake, raspberry press cake and olive waste) will be investigated for their potential to be valorized by flash pyrolysis.

First, the characteristics of the press cakes are investigated with proximate, elemental and component analyses and their calorific values are determined. Based on these results, flash pyrolysis experiments are performed at different constant temperatures between 350 and 550 °C using a home-built lab-scale semi-continuous reactor with sand as heat transfer medium. This results in a conversion of the solid press cake into three fractions: char (solid), pyrolysis oil (liquid) and pyrolysis gas. A mass balance is calculated for each experiment to determine the optimal pyrolysis temperature. Generally, higher pyrolysis temperatures result in a higher yield of pyrolysis oil, while the yield of the char fraction decreases.

In this study, the focus is mainly on the characterization of the pyrolysis oil samples with several complementary analytical techniques. Each sample is investigated with GC/MS and FTIR to determine the (possible) presence of 'value added chemicals' in the pyrolysis oil. Concerning the usage as fuel (additive), important parameters such as the calorific value, the water content and the pH-value are measured for each pyrolyses oil sample.

Mark Stals
Ph.D. Student, Hasselt University, Belgium.

Activation and Characterization of Pyrolysis Chars from Short Rotation Hardwoods

Chars from fast and flash pyrolysis of three short rotation hardwoods (i.e. *S. fragilis, P. Grimminge* and *P. nigra*) are used as precursor material for the preparation of activated carbons (AC). Physical activation using steam and chemical activation with potassium hydroxide are performed, resulting in 12 different AC. Char and AC yields are calculated and the obtained AC are characterized.

Nitrogen adsorption at 78 K is applied to obtain the equivalent surface area and information concerning the pore structure. Methylene blue (MB) and iodine adsorption experiments have been performed to gain additional information on the AC's adsorption properties. A commercial AC (Norit GAC) is used as reference.

Nitrogen adsorption shows large equivalent surface areas of up to 3800m²/g All activated carbons have a well developed microporous structure, and in the case of physical activation, some mesoporisity is also present.

Langmuir and Freundlich adsorption models are applied on the methylene blue adsorption data. The Langmuir isotherm shows a better fit than the Freundlich isotherm. In all cases, chemical activation yields a higher adsorption capacity than physical activation. All AC (except for one) adsorb at least 70% of their maximum MB adsorption capacity within 15 minutes. The highest MB uptake obtained is 727 mg of MB adsorbed per gram AC while the reference adsorbs 246 mg of MB per gram AC.

A good iodine uptake is observed. Chemical AC shows a higher iodine adsorption than physical AC. Highest ioding uptake observed is 2913 mg iodine per gram AC while the reference adsorbs 1198 mg iodine per gram AC.

These findings illustrate that fast and flash pyrolysis chars from short rotation hardwood are a promising precursor for activated carbon production.

Apichit Svang-Ariyaskul
Lecturer, Thammasat University, Thailand.
Apiwat Rodklai, Michael L. Kallal & Chak-krit Sawangsaensook
Thammasat Universtiy, Thailand.

Optimization of Biodiesel Production Using Reactive Separation Process

Biodiesel production has gained significant attention from both industries and academia as biodiesel is a leading renewable and clean energy resource for the future. This work focuses on the optimization of biodiesel production using integrated reactive separation process compared with a separated set of reaction and separation process to produce highest product yield and purity while costing lowest capital and operating costs. The reactive separation process focus on reactive absorption which is quite new compared to reactive distillation. Feed stock came from bio-oil available in Thailand. Two types of catalysts, acid and basic, were used to determine the optimal reaction kinetics. Process technical and economical feasibilities were evaluated. The integrated process efficiency was compared to the conventional process. The results showed that the integrated reactive separation process is promising and is more efficient than the conventional process in both product yield and purity and production cost.

Nikolay Takuchev
Lecturer, Trakia University, Bulgaria.

Study of the Urban Air Pollution Over Stara Zagora, Bulgaria with a Mobile Automatic Station

Stara Zagora city, Bulgaria (population approximately 150000) is undergoing frequent air pollutions. An experiment with a mobile automatic measuring station (AMS) aiming at study of the ground field of the air pollution in the urban area in the condition of a temperature inversion in the surface air, was carried out. The experiment was conducted in the winter (2010/2011) when the ground-level inversions are common in the area. Concentrations of several air pollutants and meteorological parameters were measured with the mobile AMS in 10 points 3 times a day - morning, noon and night. The concentrations of PM10, NOx, SO_2, H_2S and CO, were measured. The measuring points were in busy intersections, industrial areas and residential areas. The experiment was conducted in two phases under similar weather conditions. Phase 1 was repeated (Phase 2) after 20 days. 3 fixed AMS in the city area were used as additional measurement points. An approximation of the average daily distribution of the contamination was made and city maps with the obtained data were drawn up. Areas in the city with air pollution, similar in shape and location, were found during both phases of the experiment. The PM10 formed a narrow strip of high concentration in North - South direction (exceeding twice the maximum permissible concentration). The strip pollution covered major streets in this direction and showed the main source of pollution – the traffic. Junctions have proved to be a sustainable source of nitrogen oxides and carbon monoxide. The sulfur dioxide pollution passing through the city was dynamically observed – the time, direction and concentration of its movement were measured simultaneously by the three fixed AMS in the city and the Mobile AMS.

Letchumi Thannimalay
Lecturer, University of Malaya, Malaysia.
Sumiani Yusoff
University of Malaya, Malaysia.
Chen Sau Soon
SIRIM, Malaysia.

Global Harmonisation of Classification and Labelling of Mixtures and Consumer Product in Malaysia

The Globally Harmonised System (GHS) for classification and labelling is an internationally agreed system for hazard classification for pure chemicals and mixtures. In Malaysia there is no chemical database and also no regulations pertaining safety of chemicals in consumer products. GHS Toolkit was developed to facilitate in classification and labelling of 16 physical hazards, 10 health hazards and three environmental hazard for mixtures which also can be used to classify consumer products. Software for the Toolkit was developed according to the Globally Harmonised System(GHS) and Malaysia Classification System for Hazardous Chemicals (CLASS) regulation that will be enforce in 2011. The toolkit has a chemical database that contains about 700 pure chemicals which were already classified according to the GHS classification. The software was developed due to the need to classify products that contains large number of ingredients such as detergent. Disadvantage of manual classifications are time consuming and high tendency to make mistakes during classifications. Conventional classification for products using experimental data are expensive and could be replaced by GHS toolkit. Testing on animals was also not recommended in many countries due to the welfare of the animals. Development of the toolkit is very handy and useful. The toolkit was able to produce mandatory labels that were required by the local and international regulations. The actual experimental testing that were conducted on laundry detergent were acute toxicity, ecotoxicity, biodegradation, corrosivity, skin irritation and eye irritation. Validation of the toolkit was conducted using laundry detergent. Results from the experimental data and manual calculation were compared with the results from the GHS Toolkit. The result of the study shows that the toolkit is very accurate, fast, robust, reliable and cheap in classification and labelling of products or mixtures.

Kuo-Jui Tu
Student, National Cheng-Kung University, Taiwan.
Yen-Hua Chen
National Cheng-Kung University, Taiwan.

Synthesis and Photocatalysis of Hematite Thin Films Fabricated by RF Magnetron Sputtering Deposition

Environmental issues such as water and air pollutions are increasingly important. Numerous treatment technologies to eliminate or reduce environmental problems have been developed, for example, biodegradation, adsorption, and photocatalysis. Photocatalysis is an environmentally friendly process that utilizes irradiation energy to perform catalytic reactions. Thus, photocatalysis technology has been widely investigated for pollutant eradication, and nano-photocatalysts or nano-grained thin films have been intensively studied. In this study, we have examined the possibility of applying hematite (α-Fe_2O_3) thin films to wastewater treatment by photocatalysis.

The nano-grained hematite thin films are deposited by a R.F. magnetron sputtering system and used to remove methylene blue dye by photocatalytic decomposition. The grain sizes of hematite thin films are 29, 87, and 154 nm, which are along with the thickness of 172, 367, and 553 nm, respectively. Moreover, the hematite thin film exhibits a super-paramagnetic behavior and its band gap is around 1.91 eV. It is observed that all the films exhibit good photocatalytic activity under visible-light irradiation. The decomposition efficiency increases with an increase of grain size. It is because the film with a larger grain size would have a rougher surface, which is corresponding to a higher surface area. Therefore, this promotes the adsorption of more dye molecules onto the surface (more reaction sites), thereby enhancing photocatalytic activity. Hence, hematite thin film is a superior photocatalyst under visible-light irradiation, effective for the clean removal of organic dyes, and maybe suitable for wastewater treatment applications.

Inge Velghe
Ph.D. Student, Hasselt University, Belgium.
R. Carleer
Hasselt University, Belgium.
J. Yperman
Hasselt University, Belgium.
S. Schreurs
Department TIW, XIOS., Belgium.

Study of the Pyrolysis of Municipal Solid Waste for the Production of Renewable Fuels and Chemicals

Pyrolysis experiments of municipal solid waste (MSW) are carried out in a semi-batch reactor under inert nitrogen atmosphere. Slow pyrolysis – characterized by long residence time (2 hours), heating rate of 4°C/min with sand acted as heat transfer medium- is performed till 550°C. Fast pyrolysis - characterized by short residence time (few minutes), high heating rate with sand acted as heat transfer medium- is performed at 450, 480, 510 and 550°C and different input transfer rates (12 or 24g MSW/min). The pyrolysis products are studied on composition and yield/distribution and investigated for their use as fuel or raw chemical feedstock.

Slow pyrolysis liquids can be separated in a water rich and a water poor oil product. For all fast pyrolysis conditions, MSW decomposes to a viscous, brown oil which contains a poly (ethylene-co-propylene) wax. Composition analysis by GC/MS of the oil products (slow/fast) shows that aliphatic hydrocarbons are the major compounds, which can be interesting as a chemical feedstock fraction. The pyrolysis oils have high caloric, low wt% of water and low O/C values. These properties made the oils promising as fuel. The attempt to converse the waxy material by decreasing input transfer rate is only sufficient at fast pyrolysis temperature 510°C. The waxy material can have possibilities for applications as paraffin wax or can be upgraded to lighter (fuel) fractions. The optimal pyrolysis condition, regarding to oil yield, fuel properties, and wax yield is fast pyrolysis at 510°C with 24g material/min input transfer rate.

The pyrolysis gasses produced are energetic rich HC gasses. In addition, the main gasses can be valuable within the chemical industry.

ICP-AES analysis of pyrolysis products reveals that inorganic compounds present in MSW are mostly distributed in the solid fraction. In view of recycling of metals in industry, elemental metallic compounds present in the solid fraction can be easily removed through sieving.

In conclusion it should be stated that MSW has potential as chemical feedstock as such and certainly after upgrading.

Merete Wildner
Student, Aarhus University, Denmark.
Bettina Foged
Professor, Aarhus University, Denmark.
Mads Sorensen
Professor, Aarhus University, Denmark.
Christian Koch
Professor, Aarhus University, Denmark.

Cleantech Niche Development

The topic Cleantech Niche Management is an attempt to kick start the research within what it takes for Cleantech niche companies to move up towards the socio technical regime (Geels 2005).

Climate change dynamics enables a number of new companies and businesses to emerge. With a point of departure in Geels' (2004) multi-level perspective model, which describes the landscape Cleantech companies operate in, this paper looks into what it takes for a niche company to be able to manoeuvre, evolve and mature in this framework.

Cleantech Niche Development is defined as a way of acting for Cleantech companies which enables them to move up in the Cleantech landscape as defined by Geels. It is analysed whether Cleantech Niche Development is different from general niche development.

A company that manages to perform successful Cleantech Niche Development will be able to have an environmental and economic sustainable business with prospects to a future without subsidies, enabling them to compete with companies from the dominant regime.

The empirical work has been conducted as six qualitative semi structured interviews with niche Cleantech companies, Cleantech Networks and governmental institutions.

By combining theory and empirical surveys, we have found that Cleantech Niche Development distinguishes itself (from general niche development) in the following five elements:

- Cleantech marketing

- Political aspects

- Networking

- Strategizing

- Social relations

The analysis shows that some of the overall competences the Cleantech Leaders should possess are the ability to act in chaos and the ability to act upon the paradoxical and complex surroundings while making meaning for their co-workers and network.

Yiping Xu
Associate Professor, Chinese Academy of Sciences, China.
Min Qiao
Chinese Academy of Sciences, China.
Yiqi Zhou
Chinese Academy of Sciences, China.
Zijian Wang
Chinese Academy of Sciences, China.

Occurrence and Removal of Organic Micropollutants in Advanced Treatment Processes of Wastewater

A lot of organic micropollutants with adverse effect and environmental concerns have been found and identified in the wastewater, which can enter the environment via effluent from wastewater treatment plants (WWTPs) and cause a wide variety of environmental problems, suggests the need of improvement in water recycling. In this study, six advanced treatment technologies in two typical WWTPs in Beijing, coagulation-sedimentation technology (CS), ozone and biological oxidation combined technology (O+B), microfiltration (MF), ultrafiltration (UF), ultrafiltration and reverse osmosis combined technology (UF+RO), as well as activated carbon filtration (AC) technology, have been investigated for there ability to remove organic micropollutants, including 17 organochlorine pesticides (OCPs), 16 polycyclic aromatic hydrocarbons (PAHs), 12 polychlorinated biphenyls (PCBs), 54 volatile organic compounds

(VOCs), 6 phthalates and technical 4-nonylphenols. In raw wastewaters from secondary sedimentation processes, concentrations of these organic micropollutants were comparable to those found in wastewaters around the world. Among six advanced treatment technologies, removal efficiencies for different types of organic micropollutants were quite different. UF+RO and AC technologies were responsible for the greatest proportion of removal for all kinds of organic micropollutants, whereas MF and UF were much less efficient for removal of these organic micropollutants. PAEs and 4-NPs were much easier to be decreased than other chemicals, however, VOCs and PAHs were hard to be removed by tested advanced treatment technologies. The ability of UF+RO and AC technologies to remove many of the organic micropollutants was demonstrated and highlights the need for continued research into monitoring wastewater treatment, improved water recycling schemes and ultimately, safer water and a cleaner environment.

Parisa Ziarati
Head of Biological Chemistry Department & Dean of Education in Advanced Sciences & Technologies Faculty, Islamic Azad University - Pharmaceutical Sciences Branch, Tehran, Iran.

Contamination of Cadmium and Lead on Iranian Jujube

Introduction: "Jujube "a herbal medicine have received considerable attention among people in different regions of Iran. However, little is known about suitability and appropriateness or even dosage of this alternative medicine. The goal of this project was to demonstrate ranges and variability of the heavy metals content of Jujube sold in the market.

Methods: To examine the heavy metal and other metals' levels in Jujube, 10 samples were purchased from 10 different markets at each month for nine consecutive months of the year 2010 starting from January to the end of September. A certain volume of each samples were digested using, sequentially HNO_3 and HCl. Metals released by the digestion were added to NH_4I solution, later on were extracted and then analyzed by atomic absorption spectrophotometer.

Results: The concentration levels of Lead, Cadmium, Copper, Zinc, Cobalt and Nickel were different from one market to another market. Our results were determined as mean ± SD of three replicates in each test. The heavy metal levels were determined based on sample dry weight.

Conclusion: By a comparison between acceptable global standards and the level of Cadmium and Lead on investigated herbal medicines,

our results showed that the quantities of these heavy metals in the majority of samples with lower quality were higher than acceptable intake recommended by global standards. Considerable attention for alternative therapy should be done especially for patients who may intake these herbal medicine for a long time.

Gulay Zorer Gedik
Professor, Yildiz Technical University, Turkey.
Rengin Unver
Professor, Yildiz Technical University, Turkey.
Esra Sakinc
Research Assistant, Yildiz Technical University, Turkey.

Building Envelope Design in Terms of Visual and Thermal Comfort in Offices

Building envelope separates indoor from outdoor and plays the most important role to realise the necessary comfort conditions of the users in a room. Perfection of a building envelope depends on the appropriate solutions for the various parameters of the visual and thermal comfort of the users. The transparent part of building envelope-window- is necessary to maintain visual contact with outdoor and natural lighting. Although providing natural light and positive effect on the visual aspect, windows can cause undesirable thermal conditions in the spaces. To eliminate the inappropriate design specifications of an envelope having transparent and opaque parts, artificial lighting for visual comfort and artificial heating for thermal comfort are necessary. However, the progressive decrease of the energy sources on earth and the increase of the energy costs are the most actual problems in today's world. Because of this, the efficient use of natural and artificial energy sources has become an important factor in the energy and cost saving for the visual and thermal comfort fields. Building envelope properties should be determined to provide the

different comfort requirements as well as energy conservation in the design stage of the building.

The aims of this paper are to explain the calculation results of various building envelopes in terms of visual and thermal comfort conditions for the offices placed in Istanbul and to present data beneficial to building envelope design. The applied method is assessment of the various building envelopes from the point of the view of the daylight and heat, comparison of the outcomes and determination of the building alternatives performance according to the integrated results.

In the study, three different room dimensions, three different window types and four different wall constructions are chosen considering the materials used mostly in Turkey. Each room has single facade oriented to the cardinal directions with one window on it. Calculations are made for obstructed and unobstructed office buildings. From the view point of the visual comfort, daylight illuminances on the working plane are calculated for different facade features according to the average sky model. Investigation of the envelope alternatives in terms of heat, covers checking the internal surface temperatures and interstitial condensation of the external wall constructions and calculation of the heating energy consumption of the rooms.