8th World Congress and Expo on Recycling

June 25-26, 2018 | Berlin, Germany

Scientific Tracks & Abstracts
Day 1

Recycling Expo 2018

Sessions:

Day 1 June 25, 2018

Circulatory Economy | E-Waste Recycling and Management | Waste Water Recycling | Industrial Waste Recycling | Agriculture Waste Recycling | Waste Management Techniques | Renewable Energy

Session Chair
E David
National Institute of Research and Development for Cryogenic and Isotopic Technologies, Romania

Session Chair
Muscolo Adele
Università Mediterranea di Reggio Calabria, Italy

Session Introduction

Title: **The influence of material flow on ecological cost in the waste paper recycling and manufacturing process**
Tiejun Dai, Beijing University of Technology, China

Title: **Treatment of wastewater from microelectronic industry: Process analysis of a combined process scheme**
F Veglio, University of L'Aquila, Italy

Title: **Waste and energy management challenges of biopharmaceutical APIs manufacturing industries in China**
Jimmy Yun, University of New South Wales, Australia

Title: **An innovative approach for e-waste issues solving**
F Veglio, University of L'Aquila, Italy

Title: **Transforming ash to resources by electrodialytic separation – Sewage sludge ash as an example**
Ottosen L M, Technical University of Denmark, Denmark

Title: **Ammoniated rice straw as feed for ruminants**
Muhammad Rusdy, Hasanuddin University, Indonesia

Title: **Waste management, treatment and disposal at Kuwait Oil Company (KOC)**
Kholood Yousef, Kuwait Oil Company, Kuwait

Title: **Butyl rubber recycling by means of gamma radiation followed by mechanical shear**
Sandra R Scagliusi, Institute for Energy and Nuclear Research, Brazil

Tiejun Dai, Int J Waste Resour 2018, Volume 8
DOI: 10.4172/2252-5211-C1-011

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The influence of material flow on ecological cost in the waste paper recycling and manufacturing process

Tiejun Dai
Beijing University of Technology, China

In the background of fact that the problems of the resources and environment are serious day by day, waste paper, as an important secondary resource, has gradually become the most important raw material for paper making. Now the studies on environmental impact of waste paper recycling, which always use life cycle assessment, were mainly about comparison of different recycling strategy. Their results are non-monetary volume, which have difficulties on guiding enterprises to achieve win-win between economic and environmental. Therefore, in this paper, ecological cost is put forward and defined; its calculation model based on material flow was set up. Based on the material flow analysis, a standard ecological cost flow diagram (SECFD) was set up in waste paper recycling system, and the influence of deviating from SECFD on the ecological cost is analyzed. The rule of the influence of material and energy flow in the waste paper recycling system to the ecological cost is revealed. Taking the minimum ecological cost of waste paper recycling system as the objective function, the optimal design is based on the constraint condition of economic benefits, manufacturing process conditions, national policy and industrial standards. The results show that the ecological cost is reduced to 1385.69 yuan per ton after optimization, which is down by 456.8 yuan/ton compared with that before optimization, and the decrease is 24.79%. At the same time, the economic benefit is increased to 1326.95 yuan/ton, 13.51% higher than that before the optimization. And it is suggested that the enterprises of waste paper recycling should be intensive development in the future; properly control the price of waste paper, avoid the high price of waste paper. The state should give a moderate economic compensation to waste paper recycling enterprise; it will contribute to the win-win between its economy and ecological environment.

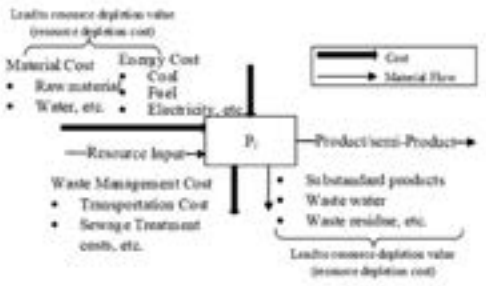

Figure 1: The cost structure in unit process P*i*.

Recent Publications

1. Dai Tiejun (2015) A study on material metabolism in Hebei iron and steel industry analysis. Resources, Conservation and Recycling 95(7):183-192.
2. Dai Tiejun (2011) The influence of iron flow on iron resource efficiency in the steel manufacturing process. Resources, Conservation and Recycling 55(8):760-771.
3. Edens B and Graveland C (2014) Experimental valuation of Dutch water resources according to SNA and SEEA. Water Resources and Economics 7:66-81.
4. Nakajima M, Kimura A and Wagner B (2015) Introduction of material flow cost accounting (MFCA) to the supply chain: a questionnaire study on the challenges of constructing a low-carbon supply chain to promote resource efficiency. Journal of Cleaner Production 108(1):1302-1309.
5. Sulong F, Sulaiman M and Norhayati M A (2015) Material flow cost accounting (MFCA) enablers and barriers: the case of a Malaysian small and medium-sized enterprise (SME). Journal of Cleaner Production 108(1):1365-1374.

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Biography

Tiejun Dai as a Professor has been dedicated to theoretical and applied researches in resource, environment and circular economy over more than a decade. He built a simplified substance flow diagram of the manufacturing process, formulated two evaluation indices of eco-connectance of an eco-industrial park and the rate of waste recovery for resource, found the stability condition of eco-industrial park, built regional (industry and waste) metabolism model, concordance analysis model of material flow and value flow, and cost-benefit model and ecological cost model for waste management, circular economy development strategy and policy, etc. He has finished a monograph, edited two textbooks, one English book and two other academic writings as an Editorial Board Member or a participant, and published 50 pieces of scientific paper, and 40 of them were collected by SCI, and EI.

daitiejun@bjut.edu.cn

Notes:

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Treatment of wastewater from microelectronic industry: Process analysis of a combined process scheme

F Veglio[1], V Innocenzi[1], I De Michelis[1], F Tortora[1], M Prisciandaro[1] and **G Mazziotti di Celso[2]**
[1]University of L'Aquila, Italy
[2]University of Teramo, Italy

The production of semiconductors requires a series of specific treatments in which a large amount of ultra-pure water is used. As a consequence of this, a large amount of polluted process water is produced that must be treated before discharged into the sewer. The treatment cost of the wastewater is a significant effect on the industrial total cost and the microelectronics industry is trying to adopt production processes accompanied by water treatment processes for production of ultra-pure water at a reasonable cost, involving water reuse. The principal pollutants are inorganic compounds such as mineral acids (sulfuric, nitric, hydrofluoric, phosphoric acids), ammonium hydroxide, heavy metals (copper, cobalt) and organic solvents. The mineral acids and the metals are successfully removed by most of the treatment processes of the semiconductor sewage industry. There are some problems in the treatment of organic compounds, among these is tetramethyl ammonium hydroxide (TMAH), $(CH_3)_4NOH$. This last is corrosive, slow to biodegrade and eutrophic to aquatic environments. Disposal of TMAH wastewaters from an industrial plant is a difficult and costly issue. The scientific literature shows that it is possible to remove this pollutant by using chemical/physical processes (e.g. advanced oxidation processes (AOP) and adsorption) as well as biological processes (e.g. anaerobic digestion). In this paper, an integrated process stream is proposed for the treatment of wastewater produced by electronic industry. A combination of chemical-physical and biological processes for the removal of TMAH and other pollutants as nitric and acetic acid is described in order to purify the water. Firstly, a series of experimental results obtained in the laboratory scale is reported, after in accordance with these results a process scheme is proposed and simulated with commercial software in order to investigate the technical feasibility and describe the overall mass balance of the whole scheme.

Figure 1: Block scheme of the process proposed for the removal of TMAH and other pollutant from industrial electronics wastewater.The process was conducted within Life Bitmaps project

Recent Publications

1. Prisciandaro M, Capocelli M, Barba D and Piemonte V (2016) Process analysis applied to water reuse for a "closed water cycle" approach. The Chemical Engineering Journal 304:602–608.
2. Huang C J and Liu J C (1999) Precipitation flotation of fluoride-containing wastewater from semi-conductor manufacture. Water Research 33(16):3403-3412.
3. Lin H L, B K Chen, H P Hsia, G H Yang, Y F Yang, Y C Chao and S S Cheng (2011) Use of two-stage biological process in treating thin film transistor liquid crystal display wastewater of tetramethyl ammonium hydroxide. Sustainable Environment Research 21:155-160.
4. Ballard T, N Chowdhury, B Heiniger, D Horner, A Lau, S Mehta, B Schilling, R Ubaldi and J Williamson (2013) Novel process for the treatment of wastewaters from the microelectronics industry. IWC 13-34.

Biography

F Veglio is currently working as a Full Professor in the Department of Industrial Engineering, Information and Economics University of L'Aquila, Italy. He has experience in the preparation and management of research projects; activity of R&D on the valorization of raw materials and industrial wastes. He has published more than 160 papers on international journals; more than 110 monographic publications; more than 100 communication to congresses, extended abstract e poster; 6 patents (3 national patent; 2 EU patents; 1 WO).

ida.demicehelis@univaq.it

francesco.veglio@univaq.it

Notes:

Jimmy Yun, Int J Waste Resour 2018, Volume 8
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Waste and energy management challenges of biopharmaceutical APIs manufacturing industries in China

Jimmy Yun
University of New South Wales, Australia

In recent years, the pharmaceutical industry in China has taken tremendous steps to reinvent itself into an environmentally responsible manufacturing industry. However, with China being a major manufacturing center for pharmaceutical active ingredients, the amount of solid and liquid waste as well as air pollutants being generated has posed significant challenge to conventional treatment technologies. According to publicly released statistics, China pharmaceutical industry emitted in excess of 500 million tons of trade effluent and 200 thousand tons of COD in 2010, representing 2.5% and 3.1% of overall industrial emission respectively. From the government perspective, learning from the experience in the past 20 years, the Ministry of Environmental Protection, China has significantly revamped its regulation, and at the same time, is empowered with new enforcement authority to ensure industry comply to newly imposed stringent emission and discharge stipulated limits. It is clear that the Chinese government is determined to reverse the environmental impact caused by rapid industrialization in the past 2 decades and return the blue sky and clear water to the people. In view of this background, this presentation will examine the technological challenges that are faced by the biopharmaceutical active pharmaceutical ingredients (APIs) manufacturing industries in China, firstly from the perspective of meeting environmental regulatory compliance, and secondly from the perspective of post-compliance impacts of the trace amount of APIs emitted to our ecosystem.

Biography

Jimmy Yun is a Professor in the University of New South Wales (UNSW), School of Chemical Engineering, and a Professor in the Hebei Science and Technology University. After a stint of early careers in research development and industries in Japan, USA, Australia and Singapore, he founded Nanomaterials Technology Pte Ltd, Singapore and was the CEO between 2000 and 2012, providing specialized R&D services to some of the most influential global pharmaceutical and specialty chemicals companies. These pharmaceutical companies include GSK, Schering Plough, Johnson & Johnson, Novo Nordisk and Huabei Pharmaceutical Company etc., and specialty chemicals companies include BASF, 3M, Evoniks, Nitto Denko and Sinopec etc. The development areas, with more than 30 patents, covered advanced drug delivery system, particle system design, advanced environmental coating and catalyst, and polymer nano-composite etc. Currently, he is actively engaged in multiple environmental projects with the pharmaceutical industry in China.

jimmy.yun@unsw.edu.au

Notes:

F Veglió et al., Int J Waste Resour 2018, Volume 8
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An innovative approach for e-waste issues solving

F Veglió, Ionela Birloaga and **Ida De Michelis**
University of L'Aquila, Italy

The waste of electrical and electronic equipment represent an important secondary resource of base, precious and rare earths elements but in the same time a serious contaminant for environment. As the disposal is no longer a suitable solution, there have been various technologies of treatment proposed to recover their content and also to eliminate the hazard of this waste. These were generally studied at the laboratory scale and just a few were further implemented at industrial level. The waste printed circuit boards, the e-component of most of all electrical and electronic devices, has been used as study material for base and precious metals recovery by all the transposed technologies from mining industry, i.e. physical-mechanical, pyro-, hydro- and bio-metallurgical procedures. There has been shown that the physical-mechanical procedures do not offer a selective recovery of their content, in particular for the precious metals. Therefore, these were generally used as a pretreatment step to the metallurgical procedures. Between all metallurgical procedures, the hydrometallurgical ones are preferred as they present a high speed of reaction with procedures that are generally easier to control at large scale. In addition, these procedures allow obtaining high grade products that can be further reused for the manufacturing of new electronic products and not limited to. Considering these aspects and also the model of circular economy, the hydrometallurgical approach for both precious and base metals recovery from waste printed circuit boards and its final products and by-products reutilization in the manufacturing of new products (electrical and electronic components and jewelry) by 3 Design Printing technology will be carried out within Fenix European Project which has as core to establish a closed loop within this waste treatment.

Figure 1: Hydrometallurgical process for e-waste treatment

Recent Publications

1. I Birloaga, I DeMichelis, F Ferella, M Buzatu and F Vegliò (2013) Study on the influence of various factors in the hydrometallurgical processing of waste printed circuit boards for copper and gold recovery. Waste Management 33(4):935-941.
2. I Birloaga, V Coman, B Kopacek and F Vegliò (2014) An advanced study on the hydrometallurgical processing of waste computer printed circuit boards to extract their valuable content of metals. Waste Management 34(12):2581–2586.
3. I Birloaga and F Vegliò (2016) Study of multi-step hydrometallurgical methods to extract the valuable content of gold, silver and copper from waste printed circuit boards. Journal of Environmental Chemical Engineering 4(1):20–29.
4. I Birloaga and F Vegliò (2016) Study on the influence of various factors in the hydrometallurgical processing of waste electronic materials for gold recovery, Book chapter in "The recovery of gold from secondary resources". ISBN: 978-1-78326-989-1:197-221.

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Biography

F Veglio is currently working as a Full Professor in the Department of Industrial Engineering, Information and Economics University of L'Aquila, Italy. He has experience in the preparation and management of research projects; activity of R&D on the valorization of raw materials and industrial wastes. He has published more than 160 papers on international journals; more than 110 monographic publications; more than 100 communication to congresses, extended abstract e poster; 6 patents (3 national patent; 2 EU patents; 1 WO).

ionelapoenita.birloaga@graduate.univaq.it
francesco.veglio@univaq.it

Notes:

Ottosen L M et al., Int J Waste Resour 2018, Volume 8
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Transforming ash to resources by electrodialytic separation – Sewage sludge ash as an example

Ottosen L M, Jensen P E, Kappel A and **Kirkelund G M**
Technical University of Denmark, Denmark

Ashes from incineration are often considered as residual waste, i.e. waste which is removed from the overall material cycle. The ashes should instead be considered as secondary resources; however, to recover the resources it is necessary to develop separation technologies. This work focuses on one such technology, namely electrodialytic separation. In this technology, the ash is suspended in water and an electric DC field is applied. Hereby ions are transported towards the electrode of opposite polarity. During treatment, pH and redox conditions are optimized for desorption of target elements, and ion exchange membranes are used to separate unwanted ions from the suspension. This work gives an example of electrodialytic separation of sewage sludge ash. A two-compartment electrodialytic cell was used, where the anode was placed directly in the ash suspension and the cathode in a second compartment, separated from the suspension by a cation exchange membrane. Electrodialytic separation simultaneously desorbed phosphorous and heavy metals into the liquid phase of the suspension. The desorbed heavy metals were transported into the cathode compartment in the applied field. Phosphorous rich crystals were produced (about 25 wt.% P) by evaporation of the filtrate. The ratio of heavy metals to phosphorous in the crystals was comparable to the very low end in phosphorous fertilizers at the market today. The mineral fraction of the SSA after recovery of phosphorous was tested as cement replacement in concrete. The resulting concrete had an interesting aesthetical expression because of a warm red colour, and the material properties were highly encouraging.

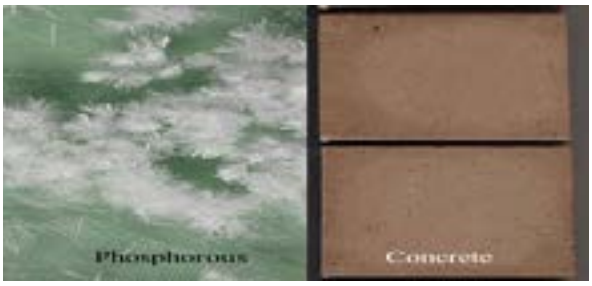

Figure 1: Phosphorous rich crystals and concrete produced with the treated ash

Recent Publications

1. Ottosen L M, Jensen P E and Kirkelund G M (2016) Phosphorous recovery from sewage sludge ash suspended in water in a two-compartment electrodialytic cell. Waste Management 51:142-148.
2. Kappel A, Viader R P, Kowalski K P, Kirkelund G M and Ottosen L M (2018) Utilization of electrodialytically treated sewage sludge ash in mortar. Waste and Biomass Valorization DOI: 10.1007/s12649-018-0215-z.

Biography

Ottosen L M has MSc and PhD degrees from the Technical University of Denmark. She has more than 140 Web of Science journal papers. She is leading the research group ZeroWaste Byg. She is a Section Leader of the Section for Construction Materials and Durability at Department of Civil Engineering, Technical University of Denmark.

lo@byg.dtu.dk

Muhammad Rusdy, Int J Waste Resour 2018, Volume 8
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Ammoniated rice straw as feed for ruminants

Muhammad Rusdy
Hasanuddin University, Indonesia

Rice straw is agricultural byproduct with many potential uses. As animal feed, it has low digestibility, crude protein and mineral content and do not meet maintenance level of energy requirement for ruminant. Pre-treatment with ammonia gas or urea can greatly enhance intake, digestibility and crude protein content of rice straw and will improve the productive performance of the ruminants. However, because much of urea or ammonia is easily degraded in the rumen and much of absorbed N tends to be lost to the animal by excretion in the urine, to maximize the efficient use of ammoniated rice straw for ruminants, a small amount of rumen in degraded protein available for post-ruminant digestion is desirable.

Biography

Muhammad Rusdy is an Animal Scientist holding Doctor in Pasture Agronomy from Faculty of Agriculture Kyushu University, Japan. He is Full Professor in the Department of Forage Science and Grassland Management Faculty of Animal Science Hasanuddin University, Indonesia. He has published about 60 articles both in peer review domestic and international journals. Due to scarcity of feed in Indonesia, he has interested to study the establishment and growth of high potential forage that suitable to be developed in Indonesia. He also has interested to study the use of agricultural wastes as ruminant feed and had presented his paper entitled Banana Wastes as Ruminant Feed in Recycling Expo that was held in Rome, July 2017. He has acted as Reviewer for many journals, both indexed and non-indexed in *Scopus*.

muhrusdy79@yahoo.co.id

Notes:

Kholood Yousef et al., Int J Waste Resour 2018, Volume 8
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Waste management, treatment and disposal at Kuwait Oil Company (KOC)

Kholood Yousef, Zainab Hussain and **Haitham Fouzy**
Kuwait Oil Company, Kuwait

Kuwait Oil Company (KOC), a subsidiary of Kuwait Petroleum Corporation (KPC), is involved in exploration, drilling and the production of oil and gas. The massive effort in producing this oil includes the employment of 9000 plus employees, involvement of thousands of contractors, operating thousands of wells, numerous gathering centers, gas compression booster stations, drilling rigs, crude oil bulk storage tank farms, marine transport loading facilities, and a significant number of transportation pipelines. The significant oil production related activities generating waste over large land area include drilling, production, maintenance, construction, materials procurement, as well as use of office and housing complexes. The issue of waste management in KOC covers analyses of different types of waste streams (solid, liquid, and sludge), the activity upon waste, and a holistic view of the goals of waste management and approach. The increasing volume of waste generated, which is exacerbated by a lack of proper waste management is a concern worldwide due to social, economic and environmental implications. KOC always ensures that the generated waste be managed effectively in compliance with applicable regulations of Kuwait Environment Public Authority (KEPA) and KOC; HSE management system (HSEMS) procedures implemented for KOC facilities. In addition, KOC plays a dynamic role in facing the adverse effects of waste through the implementation of many projects in the regions of waste management and by focusing on the development of long-term waste management strategy covered all KOC activates. This study was conducted to present the waste management, treatment and disposal at KOC. In addition, in this paper we will discuss various processes used in KOC areas indicating how waste is being managed.

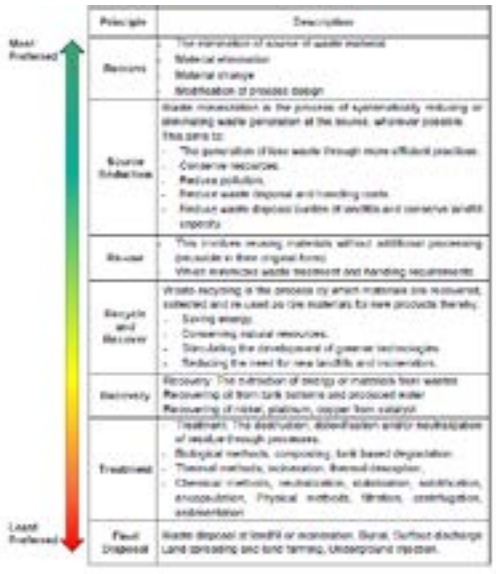

Figure 1: Kuwait Oil Company waste management approach.

Biography

Kholood Yousef has completed Bachelor of Science in Chemical Engineering, Kuwait University, Kuwait, 2000 and Major in Chemical Engineering. She has her work experience with Kuwait Oil Company (KOC) for past 14 years (2002 to 2015) in Health, Safety and Environment (HSE group), KOC. She is a Senior Environmental Engineer in Kuwait Oil Company, Kuwait from 2004 – Present. She is certified by NEPOSH and she has trained & worked/exposed on different environmental subject such as waste management issues, environmental and social impact assessment, environmental aspects identification, management of energy & resources, energy management program, air emissions controls, inland oil contingency response plan, chemical spill response plan, waste management, sewage management, industrial liquid wastewater management, environmental standards and investigation committees. She has done many projects related to environmental management in KOC and has vast experiences in the HSEMS Management System from Oil and Gas Industrial Sector; she is a part of many task force teams and committees.

Khyousef@kockw.com; hfouzy@kockw.com

Sandra R Scagliusi et al., Int J Waste Resour 2018, Volume 8
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Butyl rubber recycling by means of gamma radiation followed by mechanical shear

Sandra R Scagliusi, Elizabeth C L Cardoso and **Ademar B Lugão**
Institute for Energy and Nuclear Research, Brazil

Polymeric materials (plastics and rubbers) cover a continuously raising proportion of urban and industrial solid wastes discarded in landfills and consequently their impact on environment are more and more concern. Rubbers exhibit a very slow natural decomposition due to their chemical structure weather resistant as well to enzymatic degradation and to microorganisms. Rubber recovering is hampered by its insolubility caused by crosslinked structures. Besides, this tridimensional structure causes various problems for material recovering and reprocessing. Just 8% to 12% of polymeric residues are thermoplastic polymers; remaining are elastomers especially post consumption tires. It is relevant to emphasize that the crosslinking is essential for practical use of rubber and this process is worldwide known as vulcanizing process, discovered by North American Charles Goodyear. The implementation of new technologies in order to reduce polymeric residues, acceptable from the environmental viewpoint and at an effective cost proved to be a great problem due to inherent complexities for polymers reuse. Ionizing radiation has capacity to change structure and properties of polymeric materials. Butyl rubbers have been used in wide scale within a variety of applications such as tires spare-parts and diverse artifacts. Major effect of high energy photon, such as gamma rays in butyl and halo-butyl rubbers is the creation of free radicals accompanied by changes in mechanical properties. This work aims to the development of processes of controlled degradation (de-vulcanizing) of butyl rubber in order to characterize their availability for modification and changes of their properties. Experimental results obtained showed that butyl rubbers irradiated at 25 kGy and further sheared can be used as the starting point for mixtures with pristine rubber.

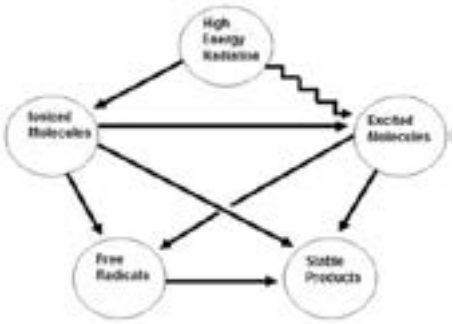

Figure 1: Radiation interaction products with atoms or molecules

Recent Publications

1. Scagliusi S R, Cardoso E C L and Lugão A B (2016) Study of recycling feasibility of bromobutyl rubber to gamma radiation. Journal of Materials Sciences and Applications 2:1-9.
2. Zaharescu T, Zen H A, Marinescu M, Scagliusi S R, Cardoso E C L and Lugão A B (2016) Prevention of degradation of γ-irradiated EPDM using phenolic antioxidants. Chemical Papers 70(4):495–504.
3. Scagliusi S R, Cardoso E C L, Parra D F, Lima L F C P and Lugão A B (2013) Evaluation of "Payne effect" in radiation-induced modification of chlorobutyl rubber. Radiation Physics and Chemistry 84:42-46.
4. Scagliusi S R, Cardoso E C L and Lugão A B (2012) Radiation-induced degradation of butyl rubber vulcanized by three different crosslinking systems 81(8):991-994.

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Biography

Sandra R Scagliusi has great experience with elastomers. She has upgraded in recovering of rubbers, in general, specially dealing with butyl and halo-butyl rubbers (chlorine and bromine). She is deeply involved with irradiation, recycling, de-vulcanization, and micro-wave. She developed a new process of rubbers recovering via radiation and mechanical shear. She has been dedicating in research toward environmental area in recycling of solid materials and elastomers. She has proved experience in research and quality control laboratories.

scagliusi@usp.br

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Scientific Tracks & Abstracts
Day 2

Recycling Expo 2018

Sessions:

Day 2 June 26, 2018

Renewable energy | Waste Management Techniques | Plastic Recycling | Waste Water Recycling | Solid Waste Management | Industrial Waste Recycling | Home-waste Management

Session Chair
Muhammad Abdul Jalil
Bangladesh University of Engineering and Technology, Bangladesh

Session Chair
Muscolo Adele
Mediterranea University, Italy

Session Introduction

Title: **Waste stream treatment for obtaining safe reclaimed water and biomethane for transport sector to mitigate GHG emissions; Life Methamorphosis – LIFE14 CCM/ES/00865**
Gloria Sanchez Santos, Metropolitan Area of Barcelona, Spain

Title: **Removal of Pb^{2+}, Ni^{2+}, Cd^{2+}, Zn^{2+} from wet process phosphoric acid by mueroxide impregnated activated bentonite**
Mohamed F Cheira, Nuclear Materials Authority, Egypt

Title: **Mechanical drying of plastic films**
Oksana Horodytska, University of Alicante, Spain

Title: **Treatment of Tannery Effluent by Electrocoagulation**
Muhammad Abdul Jalil, Bangladesh University of Engineering and Technology, Bangladesh

Title: **Utilization of urine and weed of *Chromolaena odorata* as a basic materials for liquid fertilizer**
Syamsuddin Hasan, Hasanuddin University, Indonesia

Title: **Treatment Process of CDW: Promising link to complete circular economy in the civil engineering**
Lauredan Le Guen, French Institute of Science and Technology for Transport, France

Title: **Onsite generation of electricity from discharged urine from male toilets in commercial, industrial and institutional buildings**
Ann T W Yu, The Hong Kong Polytechnic University, Hong Kong

Title: **Ten actions towards Zero Waste: Practical actions for Municipalities, citizens and companies**
Roberto Cavallo, E.R.I.C.A. soc. coop., Italy

Gloria Sánchez Santos, Int J Waste Resour 2018, Volume 8
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Waste stream treatment for obtaining safe reclaimed water and biomethane for transport sector to mitigate GHG emissions; Life Methamorphosis – LIFE14 CCM/ES/00865

Gloria Sánchez Santos
Metropolitan Area of Barcelona, Spain

The aim of the Life Methamorphosis project is to recover energy from organic solid waste from both urban and agro-industrial and farming sources to obtain alternative and sustainable fuels. This project wants to demonstrate the feasibility at an industrial scale of two innovative waste treatment systems: UMBRELLA and METHAGRO. The UMBRELLA prototype is installed in the Barcelona metropolitan plant of municipal waste treatment in Montcada i Reixac. It optimizes the energy used to treat waste water from the organic fraction treatment through the introduction of innovative anaerobic and autotrophic processes applied in series: the anaerobic membrane reactor (AnMBR) and the autotrophic nitrogen elimination system anammox ELAN®. It supposes more than 70% reduction in energy demand and up to 80% reduction of CO_2 emissions compared to conventional treatments. Finally, the biogas produced is treated with the ABAD® cleaning and refining system so that the resulting biomethane is used for automotive. The METHAGRO prototype has been built in the Porgaporcs slurry treatment plant owned by Ecobiogas and located 35 km from Lleida, in order to mitigate the problems created by the uncontrolled production of pig slurry. It demonstrates the production of biomethane from biogas with a membrane-based upgrading system. This biogas produced can be used either directly in vehicles for transportation, or it can be injected into the natural gas distribution network. To use vehicles powered by biomethane produce 25% less CO_2 emissions than those are powered by gasoline, and emit 85% less NOx compared with diesel engines. The project will contribute to the overall objective of moving towards a resource-efficient economy and the protection and improvement of environmental quality. Specifically, it aims to contribute to the development and demonstration of innovative technologies, methods and instruments designed to mitigate climate change, and their scaling, transfer or incorporation into other sectors.

Figure 1: Flow chart UMBRELLA prototype

Figure 2: Implementation METHAGRO prototype.

Biography

Gloria Sánchez Santos is a Chemist working in the service of Waste Prevention and Management in Metropolitan Area of Barcelona, local Government. She has 15 years of experience in waste management including mechanical and biological treatment anaerobic digestion and composting. In addition, she has experience working as a Technician, Quality Assessment and Researcher in waste water treatment plants and control of odors with biofilters. She collaborates in the establishment of service indicators and has at her charge the follow up of the yearly environmental and quality audit of the service processes.

ssantos@amb.cat

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Removal of Pb^{2+}, Ni^{2+}, Cd^{2+}, Zn^{2+} from wet process phosphoric acid by mueroxide impregnated activated bentonite

Mohamed F Cheira[1], Mohamed N Rashed[2], Adila E Mohamed[2] and **Mohamed A Awadallah[2]**
[1]Nuclear Materials Authority, Egypt
[2]Aswan University, Egypt

The harmful inorganic impurities in wet process phosphoric acid are essentially removed by a simple and inexpensive method for environment applications. In this work, the highly efficient removal of Pb^{2+}, Ni^{2+}, Cd^{2+} and Zn^{2+} cations (>99%) from WPPA were investigated through a batch technique using mueroxide impregnated activated bentonite. The used adsorbent was prepared within a dry method. The experimental data showed high adsorption capacity of mueroxide impregnated activated bentonite toward Pb^{2+}, Ni^{2+}, Cd^{2+}, and Zn^{2+} cations into its active sites as 170, 115, 143 and 190 mg/g at 5 M acid concentration, respectively. Moreover, most of the heavy metals were completely adsorbed from WPPA (>98%) at 5 M acid concentration. The providing data indicated that the batch sorption technique retained its functionality to effectively remove Pb^{2+}, Ni^{2+}, Cd^{2+} and Zn^{2+} cations even after six reuse/cycles, where the mueroxide impregnated activated bentonite can be regenerated using HCl. The real impurities removal from the Abu Zabaal wet process phosphoric acid using the adsorbent was assessed through the proposed protocol under optimum conditions.

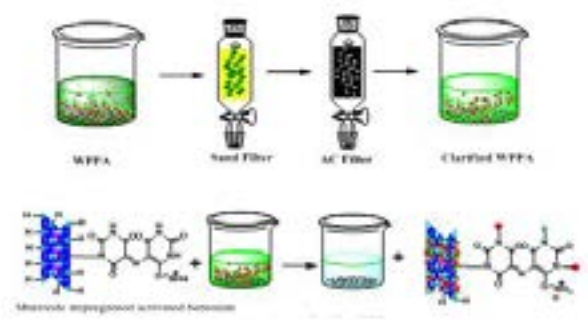

Figure 1: Mechanism of removal of metal ions impurities from WPPA using mueroxide impregnated activated bentonite.

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8th World Congress and Expo on Recycling

Biography

Mohamed F Cheira has eighteen years of diverse experience in Applied Research, Management, as well as hands-on experience in the areas of Materials Synthesis, Mineral Processing, and Chemical Hydrometallurgy. He is an Associate Professor of Inorganic Chemistry and Head of Uranium and Thorium, Analysis Lab Member of Technical Office of the Labs and Member of Scientific Office, Nuclear Materials Authority.

mf.farid2008@yahoo.com

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8th World Congress and Expo on Recycling

June 25-26, 2018 | Berlin, Germany

Mechanical drying of plastic films

Oksana Horodytska and **Andrés Fullana**
University of Alicante, Spain

Plastic films (e.g., shopping bags, flexible packaging, wraps) show different behaviour compared with rigid materials mainly due to its flexibility. During recycling, an efficient drying or dewatering of these materials is required to ensure the high quality of the recovered products. Despite the importance of good drying, this operation has not been studied at laboratory or pilot plant scale. In this work, the mechanical drying of high density polyethylene films by centrifugation has been assessed. A number of experiments were performed by using a laboratory centrifuge. The experimental results have been used to describe the process of water removal from the plastic flexible mass. Furthermore, the possibility of plastic cake formation, similar to the sludge cake, is suggested. The water is retained within the plastic cake due to three phenomenon: free water within the cake pores and voids, water maintained by capillarity (superficial and pendular) and the water trapped due to the tortuosity of the plastic mass. The experimental results showed that an optimum side length exists. The moisture content is minimized when the flake side lies between 1 and 2 cm. Finally, it has been found that the moisture content is a function of the plastic surface. Hence, the specific moisture content (the mass of water per total plastic surface) should be calculated to compare films with uneven thickness or made of different materials. In sum, the outcomes of this study could represent the fundaments of the further and more extensive research into the plastic films drying processes.

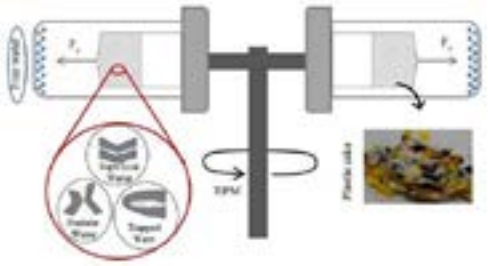

Figure 1: Mechanical drying of flexible plastic films by centrifugation at laboratory scale.

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Biography

Oksana Horodytska is a PhD candidate in Chemical Engineering within the research group: Waste, Energy, Environment and Nanotechnology (WEEN) at the University of Alicante. She has been interested in waste management from her early days at the University where she started to work on the recovery of the waste ink from the printing industry. This experience helped her to develop a full awareness of the global waste generation issue and, thus, encourage her to embark on a research project based on the plastic films waste recycling. She believes that the plastic materials perfectly meet the customer´s requirements and supports their use for a large variety of applications. However, she also believes that high efficient recycling technologies are required to ensure the sustainable development of this industry.

oksana.hka@ua.es

Muhammad Abdul Jalil et al., Int J Waste Resour 2018, Volume 8
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Treatment of Tannery Effluent by Electrocoagulation

Muhammad Abdul Jalil and **Sudipto Bosu**
Bangladesh University of Engineering and Technology, Bangladesh

Electrocoagulation (EC) has been studied extensively throughout the world during the last decade for the treatment of various types of water and wastewater. The optimum treatment times, current densities and initial pH have been reported in the literature in the range of 5-60 minutes, 10-150 A/m^2 and near neutral pH respectively for mostly high removal efficiencies. Both operating cost and electricity consumption costs have been indicated to vary between 0.0047-6.74 €/m^3 and 0.002-58.0 kWh/m^3. As EC has great potential in the field of water and wastewater purification, a study was carried out to determine the efficiency of EC to treat tannery effluent of Hazaribag, Dhaka, Bangladesh. A total of three raw effluent samples were collected from Hazaribag area and were treated in the Environmental Engineering Laboratory of BUET. The samples were tested for color, turbidity, BOD and COD. Stainless steel electrodes were used and batch experiments were conducted with 1.5 L capacity of the reactor at three different current densities (70, 140 and 210 A/m^2). For each experimental run, samples were taken out from the reactor after 20, 40, 80 and 160 minutes flow of current. All these samples were then filtered and analyzed for color, turbidity, BOD and COD. Analysis of the results showed that the color removal efficiency varied from 48.3% to 98.7% having the best performance (86.4-98.7% removal efficiency) at the current density of 140 A/m^2.The turbidity removal efficiency was found to be in the range of 82.4-99.6% with the best performance (98.9-99.6% removal efficiency) for the current density of 140 A/m^2. The BOD5 removal efficiency variedfrom 49.6 to 93.3% and the best performance (80.9-93.3% removal efficiency) was at the current density of 140 A/m^2. At the same current density, the COD removal efficiency varied within a very narrow range (76.3-78%) whereas it varied greatly (35-78%) when all the data were considered. The experimental results revealed that the optimum time and current density were 40 minutes and 140 A/m2 respectively for removal of color, turbidity, BOD and COD from the tannery effluent, and EC is an efficient process for treating tannery effluent especially for reveal of color and turbidity. The treated effluent can be recycled for various purposes.

Biography

Md. Abdul Jalil has completed first grade junior scholarship, Education Board scholarship, and BUET merit scholarship. He received his BSc in Civil Engineering in 1986 from BUET. He obtained his MSc in Civil Engineering in 1988 specializing in Environmental Engineering from the same university. He received his PhD in Civil Engineering in 1993 from Tokyo University, Japan under Asian Development Bank Scholarship. He conducted Postdoctoral Research on Water Management in Loughborough University, UK under Commonwealth Fellowship during 2005-2006. He was appointed as a Lecturer in the Department of Civil Engineering of BUET in 1986 just after his graduation. He was promoted to the post of Assistant Professor in 1989. He became an Associate Professor in 1996. He was appointed as a Professor in 2001. He has published over 37 papers up to now in international and national journals, proceedings of conferences and seminars. He presented a number of papers in home and abroad. He has worked a member of different committees of national organizations. He worked in a number of national and international research projects. He also works as a Consultant and completed over 45 important national development projects.

majalil@ce.buet.ac.bd

Notes:

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Utilization of urine and weed of *Chromolaena odorata* as a basic materials for liquid fertilizer

Syamsuddin Hasan, Syamsuddin Nompo, A Mujnisa, Sema and **Purnama Isti Khaerani**
Hasanuddin University, Indonesia

In Indonesia, livestock urine is considered as waste, while weed of *Chromolaena odorata,* which are very toxic to ruminants, is abundant in grassland area. These two materials have great potential to improve soil fertility because they can be made to organic fertilizer through fermentation. Fermentation of mixed urine, *Chromolaena* and water with the proportion of 25:25:50% added with small proportion of yeast tape, a liquid fertilized produced with nutrient contents of N, P_2O_5 and K_2O was 2.3, 0.32 and 0.15%, respectively. The research results showed that the application of liquid fertilizer significantly improved ($P<0.01$) the growth and biomass production of Panicum maximum, Brachiaria decumbens and Pennisetum purpureum where Panicum maximum showed the best response.

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Biography

Syamsuddin Hasan has his expertise in Forage and Crop Science. He has been a Lecturer of Faculty of Animal Science, University of Hasanuddin, South Sulawesi Indonesia since 1979. He was the Dean of Faculty of Animal Science, University of Hasanuddin from 2006 to 2014 for 2 periods. He was a Reviewer in The Ministry of Higher Education, Research, and Technology of Indonesia since 2004-2016. He is active to join national and international conferences as well. His target is focusing on research. Now, he is enrolled as the Head of Forage Crops and Pasture Science Laboratory, University of Hasanuddin.

syam_hasan@yahoo.com

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June 25-26, 2018 | Berlin, Germany

Treatment process of CDW: Promising link to complete circular economy in the civil engineering

Lauredan Le Guen
French Institute of Science and Technology for Transport, France

Among the many environmental interactions with human activities, the construction and building materials (bricks, plaster, asphalt or cement concrete, clay materials and slurry) are recognized as a no negligible source of pressure on the environment. It is defined as the product of the linear economy, that is, an economy that digs resources out of the ground (e.g. rock materials), transforms them into products and buries in the ground, that is, in landfill sites, at the end of the life cycle of the product. Such an approach is wasteful, for both money and resources. An alternative, the circular economy ("cradle to cradle"), consists in remanufactured and/or reused materials such as today's goods become tomorrow's goods. The French energy transition law claims that by 2020, 60% of the building and construction materials will come from recycling also called construction and demolition waste (CDW). The process evolution of the construction waste management can be considered as one of the large challenge for the civil engineering community leading to several scientific issues to overcome. Currently, the plant used for the CDW treatment manufactures products for a "low cost" valorization because of the standards and the customers' consideration and the economical concurrency. The adaptation and the modification of these plants are necessary in order to target the manufacturing of product to a high value valorization. Based on some recent studies, the perspectives of this new strategy seems to be promising.

Figure 1: The circular economy applied to the road pavement fabrication

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Biography

Lauredan Le Guen received his PhD in Civil Engineering (2012) from Ecole Centrale of Nantes, France. He works as permanent Researcher at the French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR) from 2012. He participated at one French national research program and one international research program with the University Federal of Rio Grande do Sul (UFRGS) of Brazil. He supervised several Batchelor's degree and Master's students. His scientific production reaches 9 scientific publications, 1 book chapter and around 10 communications in national and international conferences.

lauredan.leguen@ifsttar.fr

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Onsite generation of electricity from discharged urine from male toilets in commercial, industrial and institutional buildings

Ann T W Yu and **Irene Wong**
The Hong Kong Polytechnic University, Hong Kong

This research study explores the potential for producing electricity from discharged urine in the daily operation of male toilets in commercial, industrial and institutional buildings. The majority of the population in metropolitan cities lives in these high-rise buildings apart from residential buildings. High-rise buildings consume large amounts of energy in daily operation and release considerable amounts of waste including human urine into the environment. In addition, untreated urine from urinal of these buildings contains polluting organic compounds and requires energy-consuming treatment prior to discharge into waterways. Urea is a major composition of urine. Urea contains four hydrogen atoms which are less tightly bonded than H_2O in water. Hydrogen, which is a clean source of energy, is considered by scientists as a promising fuel for future. Hydrogen and urea are produced in electrolysis of urine as shown in figures 1 and 2. Operation of hydrogen fuel cells are produced in electrolysis of urine. The generated hydrogen gas can be utilized to generate electricity for building operations. Ohio University in the USA has developed Ammonia Green Box® which can extract hydrogen gas directly from urine by electrochemical oxidation using an economical catalyst. Electricity is produced from the electrolysis of hydrogen gas in a hydrogen fuel cell. The simple and convenient hydrogen extraction process is suitable to be applied in high-rise developments. Production of electricity from urine can reduce power supply from the grid system and subsequently reduce building management cost.

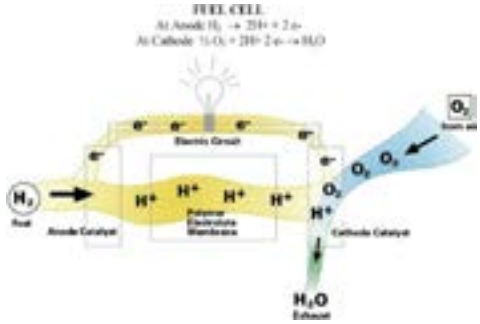

Figure 1: Operation of hydrogen fuel cell.

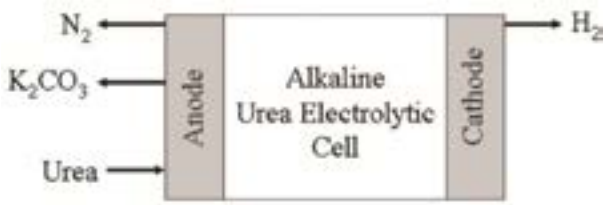

Figure 2: Schematic representation of the direct urea-to-hydrogen process.

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8th World Congress and Expo on Recycling

Biography

Ann T W Yu is an Associate Professor in the Department of Building and Real Estate of The Hong Kong Polytechnic University. She has more than 10 years of experience in the field of Value Management and more than 15 years of experience in the field of Construction and Demolition Waste. She teaches in both undergraduate and postgraduate levels, conducting research projects and carrying out consultancy services. She was the Honorary Secretary of the Hong Kong Institute of Value Management for seven years. She is a Chartered Builder, Assistant Architect, Quantity Surveyor and Project Manager by profession. Her research interest includes C&D waste management, construction project management, value management, building procurement systems and sustainable construction. She has a strong track record and has published extensively on the broad theme of project management in leading construction management journals and international internal conference proceedings.

ann.yu@polyu.edu.hk

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Ten actions towards Zero Waste: Practical actions for Municipalities, citizens and companies

Roberto Cavallo and **Umberto Gianolio**
E.R.I.C.A. soc. coop., Italy

Waste management today must come to terms with entirely new conditions. Up to a hundred years ago every product used by men was biodegradable or made with a simple chemical compound already present in the environment. The problems of pollution were therefore temporary, due to an excess of local concentration, destined to be resolved by themselves with the decrease of the anthropic pressure. The synthetic chemistry then paved the way for non-biodegradable, bioaccumulative and long-term toxic products. In addition, waste today is pervasive and spreads rapidly throughout the planet through rivers, lakes, oceans, emissions into the atmosphere ... What we "throw" into the environment lasts for thousands of years and produces irreversible damage. Definitely an inconvenient legacy for future generations. Dealing with a "zero waste" strategy is more than ever an act of profound responsibility and absolute necessity. Italy is the first nation in the world for the number of administrations, territorial realities and movements committed on the path towards "zero waste". The text presents the best Italian experiences towards "zero waste" and proposes guidelines to public administrations, businesses and citizens to prevent the negative impacts of waste. It deals with the following topics: waste prevention, reuse, recycling, recycling (supply chains, valorization, reproduct), organic waste and composting, economic instruments, eco-design as a waste prevention tool, communicating with citizens, the analysis of undifferentiated waste and the extended responsibility of the producer, what to do with what seems to be non-recyclable.

Recent Publications

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Biography

Roberto Cavallo was born in Turin in 1970. He is graduated in agronomical sciences and an international expert in environmental management, protection and safeguard. He is the cofounder of E.R.I.C.A. soc. coop., a leading company in technical consulting and environmental communication for public administrations and private firms. He is the author of several books and essays among which "Meno 100 kg. Recipes for a diet of our trash can" and "The Bible of ecology".

roberto.cavallo@cooperica.it

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