Keynote Forum
March 05, 2018

Recycling Congress 2018

5th International Conference on

Recycling and Waste Management

March 05-06, 2018 | London, UK

S Joseph Antony

University of Leeds, UK

A novel method for determining the mechanical strength of wastes-embedded concretes using the principles of photonics

Fracture toughness is a measure of the resistance of a material to fracture. This fundamental property is used in diverse engineering designs including mechanical, civil, materials, electronics and chemical engineering applications. The evaluation of this remains challenging for extremely heterogeneous materials such as concretes. This talk will focus on how the principles of photonics can be applied innovatively for evaluating the fracture toughness of composite concretes using polymeric particulates derived from Qatar municipal wastes. Different grades of particulates derived from the municipal wastes are used as a partial replacement of natural aggregates in fabricating the concretes. Then, inspired by the stress-displaying properties of human cornea, and by applying a thin cornea-like birefringent coating on the surface of opaque, notched composite concrete beams, the evolution of the maximum shear stress (/strain) distribution on the beams is sensed under the external loading. The location of the maximum deviator stress is tracked ahead of the crack tip (fracture processing zone) on the concrete samples under the ultimate load, and hence the effective crack length is characterised. Using this, the fracture toughness of the heterogeneous composite beams is evaluated and the results compare favourably with other conventional methods using combined experimental and numerical/analytical approaches. Hence the current photonics-based study could help in evaluating the failure strength of new materials using wastes more effectively in future.

Speaker Biography

S Joseph Antony is Associate Professor at the School of Chemical and Process Engineering, University of Leeds, U.K. He is an expert in the area of photonic stress analysis and multi-scale mechanics of discrete and continuum materials. His research area covers a wide range of inter-disciplinary problems using advanced computational and experimental technologies. His current research includes particulate mechanics (MD, DEM, FEM modelling), nano, micro and macroscopic properties of powders and grains, force transmission patterns in materials subjected to mechanical, electrical and combined loading conditions and developing composites for constructions from municipal wastes.

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Gyorgy Szekely

The University of Manchester, UK

Nanofiltration and molecular imprinting for waste utilization

Sustainable manufacturing is one of the grand challenges of the 21st century. It has recently been realized that conventional downstream separation processes are unsustainable because they can account for as much as 80% of the total manufacturing costs and eventually contribute 50% of the industrial energy usage. With profit margins growing thin, there is an imperative drive for minimizing both the cost and environmental impact via process intensification (PI). PI through minimizing solvent and raw material consumption, as well as utilizing waste, can make a significant difference towards environmentally benign and economically viable chemical production. As effective PI tools, nanofiltration and molecular imprinting technologies are getting recognized as emerging technologies that provide green process engineering. The presentation covers the development of sustainable separation processes based on nanofiltration and imprinted materials. Examples and industrial case studies for solvent recovery and recycling, yield enhancement, purity improvement, valorization of agricultural waste are discussed Imprinted materials offer unique separations including three-way fractionation of solutes in organic media. Synergistic coupling of imprinting and nanofiltration technologies for hybrid processes will be demonstrated. Examples will demonstrate that separation processes based on nanofiltration and molecular imprinting can reduce carbon footprint by 90% and process mass intensity by 99%.

Speaker Biography

Gyorgy Szekely received his MEng degree in Chemical Engineering from the Technical University of Budapest, and he earned his PhD degree in Chemistry under the European Commission's Marie Curie Actions from the Technical University of Dortmund. He worked as an Early Stage Researcher in Hovione PharmaScience and an IAESTE Fellow at the University of Tokyo. He was a Research Associate working with Andrew Livingston on molecular level separations in Imperial College London. He is currently a Lecturer in Chemical Engineering at The University of Manchester. His multidisciplinary professional background covers supramolecular chemistry, molecular recognition, molecular imprinting, process development, waste utilization, nanofiltration and pharmaceutical impurity scavenging. He serves as an Academic Editor for the journal Advanced Materials Letters, the Secretary General for the Marie Curie Fellows Association, and a Member of the Royal Society of Chemistry. He has over 40 publications including 4 patents and 4 book chapters.

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Cyril Aymonier

National Centre for Scientific Research, France

Exploring new horizons and sustainable technologies for recycling and waste management

Sub- and super critical fluids-based technologies are developed for more than 40 years. Years after years, the sub- and supercritical fluids route finds new applications in the field of materials processing but also materials recycling. In the last 25 years, the use of water and carbon dioxide as solvent has been extended to other fluids to increase the versatility of this materials recycling approach considered as sustainable technologies. After an introduction to the specific properties of sub- and super critical fluids, this presentation will be focused on the interest and potentialities of these advanced technologies. This will be illustrated with examples going from waste management to recycling: i) waste water treatment by Super Critical Water Oxidation (SCWO), ii) Super Critical Biomass Valorisation (SCBV) to produce energy and platform molecules, iii) recycling of plastics and carbon fibers from CFRPs, iv) recycling of permanent magnets and solar cells. At the end, the state of development of these sub- and super critical fluids-based technologies will be discussed.

Speaker Biography

Cyril Aymonier is CNRS senior researcher in charge of the department "Super critical Fluids" of ICMCB (about 25 people). His current research interests are i) the study of the chemistry and nucleation & growth in super critical fluids applied to the design of advanced nano structured materials, ii) the study of materials recycling using super critical fluids and iii) the development of the associated super critical fluids based technologies. Cyril Aymonier has so far authored/co-authored 122 peer-reviewed journal articles, 7 book chapters and 30 patents. He was awarded by the CNRS bronze medal in 2011.

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Gideon Oron

Ben-Gurion University of The Negev, Israel

The role of nanotechnology in treated waste water recycling and reuse: Effluent quality and economic aspects

Recycling and reuse of the nonconventional water resources such as wastewater is a practical solution for solving water shortages. However, the treatment level and the effluent quality is still an open question. Due to the climates changes, randomized precipitation and over pumping of groundwater there are only small chances that scarcity issues will be solved. Floods water scarcely fills the increasing gap between supply and demand. The regions suffering from water shortage and shortage in food production will probably continue to stay under scarce conditions unless special and big measures will be undertaken.

A promising solution is to desalinate low quality waters such as sea water, saline groundwater and wastewater. The effect of domestic wastewater after being treated by conventional methods and subsequently by nanotechnology is a promising solution. Although the main nanotechnology desalination suffers from adverse phenomena such as high energy demand, membranes fouling associated with decrease in flowrates and disposal of the brine, is the promising solution for coming century.

Field experiments were conducted in a typical arid zone (precipitation around 150 mm/year). The experiments lasted four years and different species of annual agricultural crops were cultivated in 0.6 hectare plots. The field trial consisted of 6 different treatments where the yield was monitored every growing season in each of them. Each effluent quality and the operating parameters of the nanotechnology system such as transmembrane pressure, retentate and recirculation flow-rates including salinity effects on productivity of agricultural crops were continuously monitored. Also were monitored the operation membrane system. The effects of water quality, expressed mainly by the Electrical Conductivity (EC) of the effluent were monitored and considered. During the ongoing experiment an economic analysis was conducted, examining the effects of water and energy consumption on fouling and the costs affecting the efficiency of the effluent application.

Speaker Biography

Gideon Oron has completed his D.Sc. studies in the Technion - Israel Institute of Technology in the area of Water Engineering. After a postdoc period in Ft. Collins (Co., USA) he joined Blaustein Institute for Desert Research (BIDR), Kiryat Sde-Boker as researcher. His activity is mainly managed around efficient use of waters in dry regions. His activity in the general area of water resources includes looking at the reuse of wastewater, runoff water and related economic aspects.

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