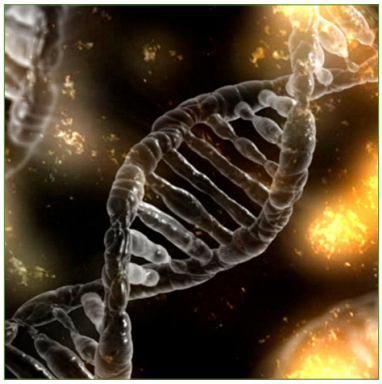
# Poster Presentation

# *Recycling 2018*







6th International Conference on

## Recycling and Waste Management

December 03-04, 2018 | Dubai, UAE

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## Recovery of the gold from electronic waste

**Jakub Klimko**
Technical University of Košice, Slovakia

Production of waste of electric and electronic equipment (WEEE) increases every year and this rare secondary raw material contains a large number of precious metals. This work describes the processing of used processors on personal computers for the purpose of gold recovery. In the paper there are described individual types of processors, methods of separation of gold coated contacts, and conditions of hydro metallurgic processing of separated contacts in order to separate the gold.

### Speaker Biography

Jakub Klimko has been studying at the Institute of Recycling Technologies, Faculty of Materials, Metallurgy and Recycling at Technical University of Kosice since 2011. During his studies, he attended a scientific conference three times, of which he was awarded twice for a high contribution to the conference. In 2016 he began his 4-year PhD study at same study program. The study focuses on the waste of end of life products such as batteries, WEEE and others.

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*Notes:*

# Video Presentation

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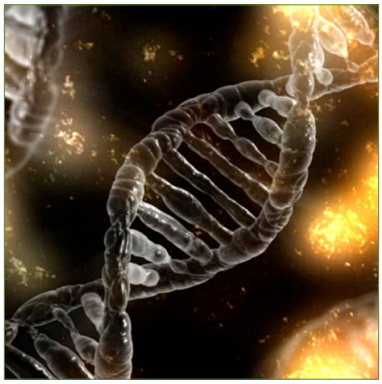

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# Nanotechnology for the manufacture of affordable housing, furniture and irrigation products from EOL waste tyres

**Brian Sulaiman**
Dena Nano Ltd., U.K

DENA Family of Companies was established over 28 years ago in 1990 by Brian Sulaiman, M. Auslmm to work in the field of advanced Nano- technology. The Company utilises a patented Reactor that modifies particles to achieve dramatic improvements in productivity, quality and profitability, with a diverse range of applications from pharmaceuticals to inks and more recently, in the eco-products arena for converting waste tyres in to high value and durable construction products. We have worked with Clients from different backgrounds include Glaxo Smith-Kline, ICI, CIBA, BP, Boots, BASF, 3M, Crown, Akzo Nobel, Astra Zeneca and many more, with Joint Venture projects world-wide exceeding sales in 2010 of £500M. DENA Nano-Wood Ltd has developed an End of Life (EOL) tyre recycling technology that creates a range of high value and durable construction eco-products whilst using zero emissions and zero waste. As the tyres are available worldwide for a fraction of price compared to virgin rubber, the raw materials cost is negative and there is also steel and fibre that can be reclaimed and sold off to provide an additional income. Whilst tyre crumbing is established, the material forming technology is completely new and has no competitors as it is proprietary and covered by several International Patents since 1991. DENA Nano- Wood Ltd uses a unique process to produce these materials using micronized rubber and a special Nano-particle composite. The resulting material has an almost endless range of final products, all of which are infinitely recyclable using the same processes that created them in the first place. These range from super-strength and durable 'wood replacement' to special porous irrigation hose.

## Speaker Biography

Brian Sulaiman gained his Doctorate from Leeds University in England and has since become a renowned expert in the field of Nano-metrics, having won several awards for Environmental Innovation. He invented the Nanometric Processing Reactor and founded Dena Technology in the mid-90s which was used to commercialise. Sulaiman's patented engineering accomplishments. Sulaiman brings a wealth of expertise in engineering technology to any project. Whilst working as a University Lecturer Dr Sulaiman was approached by an American firm who specialised in electronics who wanted him to work for them on solving a problem they had with defective microchips. During his time with them the idea for the Nanometric Process came to him during a walk on the seashore when he noticed that a rock was dispersing fine droplets of water. This gave him his initial idea for what would be the Dena Nano-Technology Reactor.

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# Accepted Abstracts

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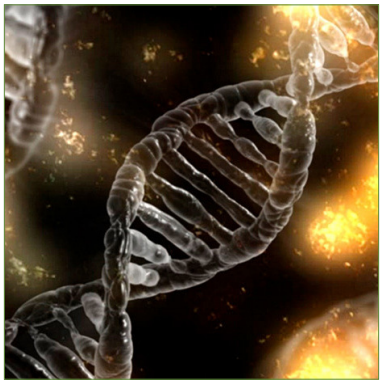

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## Recovery and recycling of laminated packing materials

**C Srinivasakannan, Pravin Kannan** and **Ahmed Shoaibi**
Khalifa University (PI Campus), UAE

It still remains a challenge to the recycling industry to develop an efficient, economical and environmentally-friendly commercial laminated packaging waste recycling system. Laminated packaging materials comprise a thin foil of aluminum, laminated in a matrix of paper and/or plastic layers, and are used for the packaging of consumer goods such as food, drinks, pet foods, toothpastes, and cosmetic products. Although few technical solutions were developed to reuse or recycle the waste, only one technology has been commercialized they have been largely impractical and not economically feasible for laminated packaging waste.

The objective of the research is to develop a recycling technique to segregate aluminum from component plastics and paper in post-consumer laminated packaging waste. The development of such a technique is essential in the recovery of valuable aluminum, cellulose fibers, and pure polymers. All these recovered materials are high valued products that are much cheaper to produce using this recycling method than conventional processes. In this project, recycling of laminated packaging waste using a solvent based delamination/dissolution would be examined. Plastics dissolution and recovery would be accomplished using organic solvents to reclaim the component polymers, typically polyethylene. Aluminum and paper would be recovered as the final insoluble residue after separating the plastics. This technique is expected to yield higher recovery rates and the reclaimed products quality would be in comparison with the virgin materials.

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## Proposed design of greywater treatment system in Batangas State University JPLPC Malvar campus

**Lavinia Mercado, Carla Antonette Aranez, Lisbeth Valiente**

Batangas State University, Philippines

Potable water is becoming a rare resource in the world. It is therefore essential to reduce surface and ground water use in all sectors of consumption, to substitute freshwater with alternative water resources and to optimize water use efficiency through reuse options. A greywater comes from sinks, shower, baths, and washing machine or simply defines as any domestic wastewater, excluding sewage. Batangas State University Malvar Campus has a total population of 5233, including students from college, elementary, faculties, employee and personnel. Increasing population of Bat state U Malvar campus can be lead to water shortage and will cause high consume billing of water which is cost an average monthly bill of 6,006 PhP according to their accounting office. Batangas State University Malvar produce high effluent of greywater with a total discharge of 57.4 gpm and as regard to our major, the researchers decided to design a greywater treatment system in Bat state U Malvar for having a new source of water for flushing toilet in the campus. The researchers get the total effluent of Bat state U Malvar by using Drainage Fixture Unit of the campus. This method provides a simple, inexpensive, and practical means of estimating flow, Based on the Result of Laboratory Analysis (ROLA) issued by Optimal Laboratory Incorporated, the Total Suspended Solid(TSS),Total Coliform Count(TCC),and Biochemical Oxygen Demand(BOD) exceeded the effluent standards set by DENR. Therefore, the greywater treatment system is needed. The researchers design a Greywater Treatment System where the treatment process to be applied is filtration and chlorination and to be constructed in Batangas State University JPLPC Malvar Campus with the capacity of 6.52$m^3$.

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## Zero waste to landfill through 5R principles of waste management

**Shalin Shah**
Adani Ports & SEZ Ltd (APSEZ), India

India presently generates 62 Million Tonnes / year (5.6 plastic waste, 0.17 biomedical waste, 7.9 hazardous waste and 0.15 E-waste). Per capita waste generation ranges from 200 grams to 600 grams per day. Out of collected 43 million tonnes per Annum (75-80%) of municipal waste, 11.9 million is treated and 31 million is dumped in municipal landfill sites (22-28%). Out of hazardous waste 3.41 mn MT (46%) goes for TSDF sites, 0.69 mn MT (9%) for Incineration and 3.35 mn MT (45%) for recycling. By 2030, waste generation will increase up to 165 million tonnes per annum.

Present regulations allow disposal of waste through landfill is conversion from one phase to another and it adds to loss of land and resources. Waste hierarchy suggests to focus on prevention first and disposal at last. Between these two ends one has to explore various options for reduce, reuse, reprocess, recycle and recovery of waste. These 5R principles of waste management have become essential for Sustainable Development.

Port & logistics do generate Solid Waste along with Industrial waste, Bio-medical Waste and E-waste. APSEZ has adopted a vision of Zero waste to landfill by 2020.

Solid Waste includes paper, plastic, metal, glass, rubber; scrap etc. is segregated at source, sent for recycling. Non-recyclable waste (Refuse Derive Fuel) is sent for co-processing in Cement kiln as a fuel. Other inert material can be converted to paver block and used for infrastructure activities. All biodegradable waste is converted to manure and same is used in-house for horticulture purpose. E-waste including other materials such as metals, plastic etc. APSEZ is towards the path of Zero Waste to Landfill.

These practices results in saving of land, resources, money, emission, pollution and helps generate revenue. Time has come to focus on value added initiatives to make business Sustainable.

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## Sorption of nitrate (NH4NO3) and phosphate (KH2PO4) on pure and surface modified forms of Mordenite and zeolite-A in liquid-solid system: A comparative study

**Masood ayoub kaloo, Bilal Ahmad Bhat, and Sheikh Abdul Majid**
J&K Govt. Degree College, India

NO3- and H2PO4- are negatively charged ions and the soil particles have a net negative charge as well, these are not strongly retained in the soil. In addition NO3- and H2PO4- are very mobile and soluble in water. Consequently these compounds are susceptible to be leached through the soil profile to groundwater and thus are made unavailable to plants for longer time. When high NO3- and H2PO4- content waters reach lake or any other water body, growth of aquatic plants is enhanced causing depleted oxygen levels and as those plants die, they are decomposed by microorganisms. The potential leaching of these nutrients can be decreased by creating sorptive or immobilizing zones in the soil by the incorporation of the appropriate sorbent in the affected area of soil. So slow release fertilizers (SRFs) are excellent alternatives to soluble fertilizers because nutrients are released at a slower rate throughout the season and thus plants are able to take up most of the nutrients without waste by leaching.

Zeolites are aluminosilicate minerals, have extremely high adsorption capacity and good catalytic properties with excellent chemical and thermal stability. They are thermally stable and have good resistance to most chemicals. Results of the exploratory investigation of a group of scientists indicate that acid-activated clinoptilolitic tuff could be considered a suitable material for removing atrazine and similar chemical compounds from water. Similarly systematic adsorption tests were carried out by S. Kolakovic et. al to determine the efficiency of organo-zeolite for removal of atrazine, lindane and diazinone from water. Clinoptilolite based separation was designed and developed for more efficient and cost effective water purification process.

In this presentation, we will discuss sorption studies of nitrate (NH4NO3) and phosphate (KH2PO4) by two zeolites viz, mordenite [Na+8 (H2O)24| [Al8Si40 O96]-MOR and zeolite-A, [Na+12 (H2O)27|8 [Al12Si12 O48]8 –LTA synthesized hydrothermally

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## Printed circuit board leach residue as a reductant for pyrometallurgical operation

**Attah-Kyei Desmond, Akdogan G, Dorfling C, Erwee M, Zietsman JH, Lindberg D** and **Reynolds Q**
Stellenbosch University, South Africa

In recent years, there has been an increase in the generation of Waste electrical and electronic equipment (WEEE) due to the advancement of technology. Printed circuit board (PCB) is the main focus of electronic waste because of the inherently high value of contained metals such as copper and gold. Hydrometallurgical processes, consisting of several leaching stages, are the most feasible option for the recovery of metals from PCB waste. However, hydrometallurgy does not address the issue of non-metallic PCB fractions that may end up being dumped at land fill sites or incinerated. When the non-metallic fractions are dumped, the heavy metals and the brominated flame retardants leach into groundwater leading to secondary pollution. Several options for treatment of the non-metallic fraction including material recycling, where the residue may be used as inclusions in concrete or asphalt materials with minimal processing or chemical recycling, where chemicals and fuels are produced from the residue using techniques such as pyrolysis exist.

Due to the complex composition of PCB leach residue, recovery by thermal treatment is likely to be the most feasible process route from technical and economical perspectives. In this study, the utilisation of the non-metallic leached PCB waste fraction as reductant in primary metal smelting operations and solid state pre-reduction is investigated. Analysis of the leached residue revealed that PCB is highly amorphous and has a carbon content of 28.5%, oxygen content of 23.1%, with the ash and volatile matter contents being 40.1% and 44.8% respectively.

Thermodynamic modelling and laboratory-scale experiments that simulate chromite smelting and solid state pre-reduction operations were performed using various blends of PCB and carbonaceous reducing agents. The models showed that PCB residue might be used to partially replace the conventional reductants. Preliminary investigations revealed that in chromite smelting the optimal blend contains up to 20 wt% PCB residue, with energy savings of 200 kWh/t of ore to achieve the same metal recovery.

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## Recycling business in the 21st century

**Michael Padi**
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From the layman's view Recycling would be seen to start from the homes but for the scientist it will be seen to start in the factory. It is a kind of a good practice to the environment. Recycling has started solving part of the environmental and atmospheric problems which we may not see now but would benefit the future generations. Sometime ago, metals were removed from the ground before planting crops, especially around homes. They do not know where to dispose them off but now it is very difficult to find metals just lying on the ground. Metals, in any form have now been turned into money and people are chasing metals for business. Used plastics have also been turned into business where people go round and pick used water sachets and sell in the name of recycling. These are forms of ways by which our environment is been cleaned up, towns and cities are been paraded by individuals in the search of metals and plastics. There is also a custom in Ghana which uses beads in celebrating a yearly occasion so recycling of broken bottles into beads have been their main occupation in that community. Organic components in the waste that would be left after sorting out metals, plastics, and bottles can be used to fertilize crops.

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