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Global Recycling Summit

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6th International Conference on

Material Science and Nanotechnology

July 22-23, 2019 | Rome, Italy

Keynote Forum

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Doron Lavee

Pareto group Ltd, Israel

Are economic tools preferable to direct regulatory measures in achieving environmental goals?

Regulators around the world are dealing with a fundamental dilemma. On the one hand, modern economic activity raises the standard of living, but on the other hand, it creates many environmental hazards that harm our quality of life. To balance these controlling effects, they are interested in bringing about social equilibrium and for the value of marginal damage to be equal to the cost of reducing it. The excessive investment will result in too much damage to the standard of living, and on the other hand, an under-investment that leaves us with excessive risks. The way to deal can be through direct command and control (CAC) or market-based economic tools. There are, of course, other essential tools, such as education and information that will not be covered in this article. Over the years, the use of economic tools in the Organization for Economic Co-operation and Development (OECD) countries increased at the expense of direct regulation, but in Israel, there is still a tendency to use direct regulation. However, since the beginning of the 21st century, there has been an increase in the use of economic tools in Israel as well. The article examines whether it is better to increase the use of economic tools at the expense of direct regulation. The examination is based on six case studies from various environmental fields in Israel. The results of the research reinforce the argument that economic tools can achieve policy objectives more effectively while driving the market to environmental improvement. However, it is almost impossible to make a clean comparison from other influences, such as the development of environmental awareness over the years, the strengthening of environmental regulation and the government's determination to achieve advanced environmental goals, especially given the international commitment to Israel's entry into the OECD. Therefore, the results should be seen as supporting evidence and not as absolute proof of the priority of the economic instruments.

Biography

Doron Lavee holds a PhD in Public Economics from the Ben-Gurion University; an MA in Economics and an MBA in Business Administration and Economics from the Hebrew University. He is a Member of the Department of Economics and Management at Tel-Hai Academic College. He also serves as a Partner and General Manager of Pareto Group Ltd. He is a well-known expert with over 22 years of experience in economic and environmental consulting, financial advisory and strategic consulting in various fields, including issues related to economic efficiency and the periphery. He has extensive experience in managing complex projects and large-scale environmental economic consulting and conducting projects for the public and government sectors, including government ministries, local authorities, government corporations and public agencies.

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Mohammad Hussain

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Manufacturing Nano-rods, nano-wires, 3D net shaped nanocrystlline products by one-step high speed turbulent electrolyte flow

This presentation will introduce the concept of Highspeed turbulent electrolyte flow (HSTEF) electroplating which has recently been invented by the author as a process for depositing nanocrystalline-Ni and alloys directly on nonconductive naturally occurring aluminum-oxide surfaces of aluminum without any pre-treatment. Graphene and related two-dimensional materials provide an ideal platform for next generation disruptive technologies and applications. Nickel nano-rods on the other hand already possess promising properties due to their magnetic behavior and their elongated shape. Highly crystalline nickel, cobalt and alloy nanowires have applications in magnetic/optical sensing and cancer-treatment/biomedicine. However, the most common nickel nanorods are synthesized by electrodeposition into porous templates, the pores of a suitable template are filled with Ni to yield cylindrical nanorods within these pores. In more detail, the template is employed as electrode and immersed in a solution of Ni cations. In a next step, a voltage is applied between the template and a counter electrode so that the Ni cations are deposited inside the pores and reduced to bulk Ni. Additive manufacturing is currently a hot topic in the world of manufacturing where instead of taking away material we add/or grow metal one particle at a time, in order to conform a piece of metal into a final product. It is therefore possible to "grow" material on a micro-scale accuracy. When requirements specify high tolerances, complexity, lightweight and miniature geometry, electroforming is a serious contender and in certain cases may be the only economically viable manufacturing process. The bottom–up approach is a wet chemical nanoparticle preparation process, which relies on building nanoparticles from the atom level of the metal, do not generally make solid objects. They make clusters, powders, or chips. The difficulty in consolidating nanostructured material is that sintering is time-consuming and at the sintering temperature, the structure coarsens. Since 2010 this process - HSTEF has been modified and developed by the author as a process for electrodepositing nanocrstalline metal/alloy micro sized components to synthesis of graphene, 40-80nm Ni/Co alloy nanowires and nano-rods without the need for electrodepositing into porous templates, a one-step process, at plating rates exceeding 1000 µm/per hour.

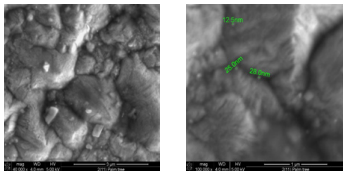

Fig.1. High-resolution SEM imaging of the surface of the nickel that was deposited by high-speed turbulent electrolyte flow plating, shows the particulate morphology, ranging from just-nucleated particles (less than 50nm) through to fully-grown grains which are micron-sized. The nickel forms a continuous dense structure, without any surface cracks, in spite of the use of a high current density during electrodeposition

Biography

Mohammad Hussain is a recognised authority on the synthesis of nanostructured surfaces by electrochemical techniques: ultra-high-speed electroforming/electrodeposition. He is the inventor of a process for depositing nanocrystalline nickel and its alloys directly on aluminium, titanium and stainless steel without any pre-treatment at a plating rate exceeding 700 µm/hour that are applied in metal finishing industry. Such coatings can provide higher wear and corrosion resistance compared to more conventional coatings. He has an established track record in initiating, growing and managing research groups in both university and industrial technology organisations.-

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Giovanna Antonella Dino

University of Torino, Italy

Exploitation of mineral waste fine fraction to produce cultivable substrates to use for land rehabilitation

Waste coming from mining and quarry industry and the ones coming from construction and demolition waste (C&DW) and rock and soil from excavation works (RSE) represent the 2nd and the 1st source of waste production at EU level (25 and 36% respectively, Eurostat 2019 – data 2016). They can cause serious environmental and economic problems in view of the difficulties related to its disposal, especially of the finest fraction. At present little is known about their potential as components of a cultivation substrate; indeed, they are characterized by low physical and chemical fertility, which require the mixing with organic materials to improve their general properties. The aim of this study is to test the agronomic characteristics of the produced mixes in order to evaluate their potentiality to be used for land rehabilitation. The investigated mineral waste (fine fraction) were residual sludge from ornamental stones working activity, sludge coming from aggregates production, tailings and waste rock fine fraction from mining activity (Zn-Pb and Ni closed mines), fine fraction connected to C&DW and RSE recycling activities. These waste materials were collected and mixed with compost, shredded green compounds, wastewater sludge and soil material. The original materials and the mixtures were analyzed for metals and hydrocarbons (TPH, where present) and for their phytotoxicity (seed germination and plants growing). The results show that mixing with organic compounds can improve the overall quality and fertility of the mineral waste fine fraction and that the mixture is not phytotoxic. This indicates that the mineral waste fine fraction could be employed, when properly managed and treated, for land rehabilitation after improvement of its fertility and of its environmental quality.

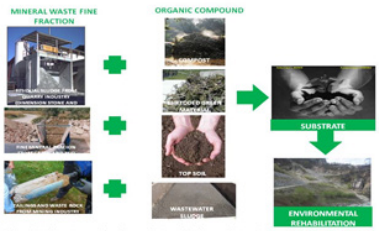

Figure 1: scheme concerning the production of substrate for environmental rehabilitation using mineral waste fine fraction and oganic compounds

Biography

Giovanna Antonella Dino, environmental engineer and PhD in environmental geo-engineering, research assistant at the Earth Sciences Department- University of Torino. Currently she is also a member of the Board of Director at CIDIU S.P.A. (Public enterprise dealing with waste management and recycling). Her research activity focuses mainly on issues related to the circular economy, landfill mining, sustainable mining and promotion and dissemination of heritage stones and. Involved, also as Project Manager, in several national and international projects concerning the aforementioned research themes. From January to May 2019 involved as external technical expert (for issues related to sustainable mining and the circular economy) for the TEG dealing with the implementation of the European Commission's Sustainable Finance Action Plan. Since 2001 she has been publishing more than 100 scientific papers and abstracts. She has been involved, as a speaker and/or chair, in more than 30 national and international conferences.

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Virginia M Ayres

Michigan State University, USA

Nanowires and Nano-enhanced Properties: What Proofs are Definitive?

The implications of nanotechnology are wide-ranging and include medicine, military applications, computing, and astronomy. There is therefore growing recognition of the importance of nurturing a community of scientists and engineers with the necessary skill set(s) needed to establish definitive proof that nanostructures and/or nano- enhanced properties are present. In the present discussion, the combinations required to establish two new discoveries in semiconducting and metallic nanowires will be presented. The first investigation details our contributions to recognition that gallium nitride nanowires, which are candidates for nanoelectronics and nanowire lasers, have interior structures that will affect their performance. An initial key observation of new "biphasic" wurtzite/zinc-blende crystalline homostructure with a sharp phase transition of 1-3 atomic layers emerged unexpectedly during a high resolution transmission electron microscopy (HRTEM) investigation of nanowires grown at 850oC. Initial "proofs" came from electron diffraction and cathodoluminescence studies that yielded unambiguous evidence for two different crystal structures and energy bandgaps, but additional HRTEM of focused ion beam cross sections was required to replace "biphasic" with the correct "nanowires within a nanowire" internal structure. Furthermore, the internal structure proved to be synthesis temperature-dependent, with an abrupt change to pure wurtzite and unanticipated internal nanopipes at 1000oC. The nanopipes identified the growth mechanism, as well as provided information for device designs. The second is an ongoing investigation of highly crystalline nickel, cobalt and alloy nanowires, which have multiple magnetic and optical sensing, and also biomedical, applications. Once again, there was an initial key observation of an unexpected result: areas of well-formed ~40-80 nm nanowires discovered during an atomic force microscopy investigation of a nanocrystalline film surface. Extensive use of recently available high resolution scanning electron microscopy with selected area energy dispersive X-ray spectroscopy demonstrated that the new regime of high-speed turbulent flow electrodeposition coupled with a thin hydrocarbon layer on the surface produced carbon nanowire-catalyst particles in metallic ion "gas" environment, while HRTEM confirmed crystallinity that exceeds current state of the art in anodized template synthesis.

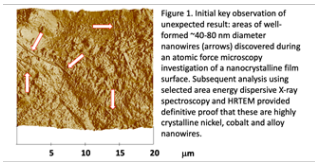

Figure 1. Initial key observation of unexpected result: areas of well-formed ~40-80 nm diameter nanowires (arrows) discovered during an atomic force microscopy investigation of a nanocrystalline film surface. Subsequent analysis using selected area energy dispersive X-ray spectroscopy and HRTEM provided definitive proof that these are highly crystalline nickel, cobalt and alloy nanowires.

Biography

Virginia M Ayres earned the Ph.D. and M.S. in Physics from Purdue University, and B.A.'s in Physics and Biophysics from Johns Hopkins University. She is currently an Associate Professor in the Department of Electrical & Computer Engineering at Michigan State University, where she heads the Electronic and Biological Nanostructures Laboratory. Professor Ayres is the recipient of numerous NSF, NASA and international awards that support ongoing research in nanoelectronics and nanobiophysics. She is honored to be the recipient of awards as a Chair of International Cooperation at Tokyo Institute of Technology and as a Distinguished Women Scholar and a Department of Physics Outstanding Alumna from Purdue University.

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Padma Singh

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Biodegradation of low and high-density polyethylene by selected microorganism

Plastic is one of the harmful and inert waste which cause serious threat to the environment especially polythene products. So, in this suggested study an effort was prepared to develop effective consortium that polythene. Consortium was a mixture of three fungus (*Aspergillus fumigatus, Fusarium sp.* and *Aspergillus oryzae*) and two bacteria (*Pseudomonas stutzeri* and *Bacillus sp.*) which can mutually grow with each other. The biodegradation was calculated on the basis of dry weight of polythene and CO_2 evolution test by shake flak method. The dry weight of polythene is major parameter to check the biodegradation. Consortium found maximum degradation in the 60 days (18.22%) in treated High-density polyethylene HDPE and (9.15%) non treated HDPE. On the other hand % degradation for treated Low-density polyethylene LDPE (52.26%) and non-treated LDPE (21.51%) were higher in 90 days which is more than other single strain degradation. The mixture of bacteria and fungi evolve high CO_2 in non-treated HDPE (92.69%) in 25 days and treated HDPE (53.33%) in 20 days. Consortium also evolved maximum CO_2 in the case of non-treated LDPE (92.48%) in 15 days and for 89.42% for treated LDPE in 20 days.

Biography

Padma Singh PhD, FBS, FAPSI is professor and Head, Department of Microbiology, Girl's Campus, Gurukul Kangri University, Haridwar, (Uttarakhand) India. She has obtained her degrees of M.Sc(gold medal) and PhD from Jiwaji University, Gwalior (MP). She has published more than 80 research papers and review articles in various national and international journals.

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Todorka Vladkova

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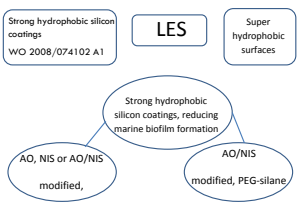
Low adhesive surfaces to non-toxic control of marine biofouling

The current non-toxic marine biofouling control is based on the idea for creation of non-adhesive, low-fouling material surfaces. Strong/super hydrophobic low-energy surfaces (LES) are preferable in the marine biofouling control because of their stability in water media. Siloxane fouling release coatings still are the only viable non-toxic commercial alternative to the toxic biocide antifouling paints although antioxidant coatings and super hydrophobic surfaces are discussed lately as other ones. However, the siloxane fouling release coatings only partially inhibit biofouling since biofilms remain a major issue. With aim to reduce bacterial adhesion and multispecies biofilm formation, non-ionic surfactants (NISs), non-toxic antioxidants (NAOs) or their combinations, NIS/NAO and PEG-silane co-cross-linker were tested as modifying agents in such nanocomposite coatings together with a creation of super hydrophobic surfaces. The antimicrobial activity was correlated to surface physical-chemical and physical-mechanical parameters relevant to bio-adhesion. Antifouling siloxane nano composite coatings were developed with excellent anti-biofouling properties: totally preventing marine macro fouling even on static immersed surfaces as ell as sharply reduced multispecies biofilm formation, the scare biofilm being easily removed by gentle wiping or cleaning with running water. All experimental results indicate that the prevention of the complex marine biofouling process requires complex approach.



Biography

Vladkova has her expertise in surface engineering starting as a member of a pioneering group in the development of brush type PEG coatings (Coll&Surf, 1986) to create bioinert biomaterial surfaces, that do not cause non-desirable response reactions. Later she moves to bioactive biomaterials and material surfaces: bio-integrating biomimetic nanocomposites for bone tissue engineering; antimicrobial collagen based nanocomposites; marine biofouling preventing composition coatings; magnetron sputtered antibacterial coatings for medical devices, etc. Inhibition of bioadhesion and biofilm formation as well as surface characteristics, influencing biofouling (medical and marine) are in the focus of her investigations with a special emphasis on the non-toxic biofouling control including super hydrophobic surfaces utilization..

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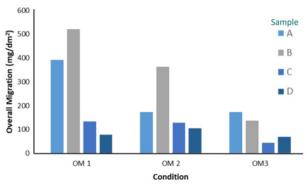
Migration of biobased plastic from biodegradable polyester and thermoplastic starch

Biobased plastic (BP) was reputed to the environmentally friendly properties. Many researches have focus on improving the physical and mechanical properties. However, as food contact materials and food packages, the migration test of BP should be conducted to ensure the safety of consumers. In this research, overall migration of 4 formulas of BP has been tested. Biodegradable polyester (polylactic acid: PLA) was formulated with thermoplastic starch (TPS) to form BP sheet samples. They were formulated at the ratio of PLA:TPS as 60:40 and 80:20 with additional of zeolite at 1% as a compatibilizer. The overall migration tests were conducted follow the Regulation EU 10/2011 on plastic materials and articles intended to come into contact with food. The chemical migrants from BP samples were extracted in food simulants. Four food simulants which were represented each kind of foods were 10% ethanol (Simulant A) for aqueous foods, 3% acetic acid (Simulant B) for acidic foods, 20% ethanol (Simulant C) for alcoholic foods, 50% ethanol (Simulant D) for dairy fatty foods. The extractions were conducted at the specific conditions, range from 2 h to 10 days at 10 to

70°C which resemble to the intended usage condition. After the extraction, the BP samples were tested for the mechanical properties compared with the samples before the extraction. The simulants were proceeded to determine the amount of migrants then compare with the overall migration limit (10 mg/dm2). The overall migration results showed that the BP samples still have some limitations in application under severe condition of overall migration testing. The mechanical test show significantly reduction of properties after contact with food simulants. Further investigations are needed to clarify the proper condition for commercial usage such as the sensory evaluation to clarify the consumer acceptability level of the reduce mechanical properties.



Biography

Busarin Chongcharoenyanon has background on food science and technology. She interested in food safety especially in microbiological and chemical aspect. The safety of food contact materials and food packaging is her main research of interest. She believes that, in order to improve the safety of the consumer, we can not only focus on the food quality but also the food packaging and the related materials.

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