identifying and chemically modifying the appropriate functional groups of a plastics. Creative solutions can be established for plastic degradability by either chemical or physical modifications of plastics. Further, plastic trash may convert into valuable other materials with the combination of creativity and physical/chemical modifications of plastic trash.

If one looks at the Sri Lankan Polymer industry, value addition did had taken place in a considerable manner, yet more space and areas left for the improvement and further developments. Nevertheless, innovative polymer modifications would be a tangible and attractive effort in uplifting our nation's economy.

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Conference Proceedings

Value added biochar for a sustainable environment

Sameera R Gunatilake

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Biochar (BC) is produced by the thermochemical conversion of biomass under anaerobic conditions. The resulting cost-effective carbonaceous adsorbent is utilized extensively due to its pollution remediation and agricultural soil amendment capabilities. Also, BC production allows solid waste management and carbon sequestration. There can be numerous chemisorptive and physisorptive mechanisms responsible for BC-adsorbate interactions which depend on the surface characteristics of BC such as the porous structure, surface functionality, and charge. The aforementioned characteristics depend on its feedstock type (FS), production conditions, and any physical and chemical value additions. The value addition of BC, which can be carried out as pre- or post-modifications, can either enhance or ease the sorption process. Enhanced adsorption capacity can be due to pore wall destruction, oxidation of surface functional groups and removal of minerals whereas magnetization leads to an easy recovery process. Furthermore, higher adsorption efficiencies can be achieved by providing optimum conditions of pH, contact time, etc. Focuses of this presentation are on correlating the effect of different FSs, pyrolysis conditions, value additions, adsorption capacities, and digestion methods with the performance of BC.

Nitric, sulphuric and hydrochloric acid modifications were carried out on tea waste biochar (TWBC) produced under three different pyrolysis conditions, 300, 500 and 700 °C, in order to evaluate how the physicochemical properties of the BC were influenced. Changes to the surface morphology and functionality, point of zero charge, cation exchange capacity (CEC), thermal stability, and ultimate and proximate analysis of both raw and modified BC were compared. The low temperature produced BC which had the highest CEC was seen to further increase upon nitric acid modification as a result of the 81.89 % increase in carboxylic functionalities. Slow pyrolyzed TWBC was utilized in studying the adsorption of Pb and Cd as well. The best performance was observed by the BC produced at 500 °C where the observed capacities for Pb and Cd were 57.8 and ~29.0 mg/g respectively. When the raw BC was magnetically modified, the adsorption capacities of Pb decreased by 15.9 %. The increased capacities of Cd by 32.75 % was due to the cationic π bonding interaction between the iron oxides and the cationic metal species. Magnetized Douglas fir BC was used to study the adsorption capacities of PO_4^{3-} and As(III). The capacities observed were 90 and 5.49 mg/g respectively, which was attributed to chemisorptive interactions that took place mainly by H bonding. Municipal solid waste BC was used for the remediation of toluene and xylene whilst acting as a means of solid waste management. Biochar produced at 300 °C using Lasia Spinosa (kohila) showed the highest capacity in a methylene blue adsorption study. The capacity was seen to further enhance by more than five times after a nitric acid premodification due to pore widening. A novel digestion method was optimized for nine different BCs where the desired dissolution of the solid matrix and matrix interference was obtained by using fuming nitric acid (98%).

***Dr. Sameera R Gunatilake** graduated from the Institute of Chemistry Ceylon in 2007 and obtained his Ph.D. in Analytical Chemistry from the Mississippi State University in 2014. He is currently serving as a senior lecturer at the College of Chemical Sciences and is the Honorary Editor of the Institute. He is also a council member at the Sri Lanka Academy of Young Scientist (SLAYS). His research interests encompass the development of an engineered low-cost adsorbent for water remediation and as an agricultural soil amendment.*

Conference Proceedings

Organic Synthesis on Graphene and other carbonaceous Materials

Laksiri Weerasinghe

Sri Lanka Institute of Nanotechnology

Carbon is widely available inexpensive material. Graphene is a two-dimensional crystalline carbon allotrope that has fascinated researchers worldwide and has extended the interest in carbon structures such as fullerenes and nanotubes Carbon-based-materials have been utilized for a variety of applications including organic synthesis and heterogeneous catalysis. Various carbonaceous materials have been used as alternatives for transition metal based catalysts. These carbon based materials have shown their potential for development of green and sustainable approaches to heterogeneous catalysis. In this presentation, the utilization of carbon-based materials as supports for heterogeneous catalysts, especially in organic transformations will be discussed. Predominantly on four categories of carbonaceous supports, namely graphene (including, graphene oxide (GO) and reduced graphene oxide (rGO), graphitic carbon nitride (GCN), carbon nanotubes (CNT) and activated carbon (AC) for various organic reactions will be discussed. Several approaches for the synthesis of these materials along with their application as heterogeneous catalysts for organic reactions will be elaborated in detail. In addition, different aspects of organic synthesis, including hydrogenation, oxidation, reduction, condensation, and multi-component reactions, catalyzed by these materials will also be discussed along with the organic transformations leading to the sustainable synthesis of valuable products from biomass. The future perspectives of this very interesting class of materials will also be provided.

***Dr. Weerasinghe** obtained his BSc special degree in Chemistry from the University of Colombo and completed his Ph.D. in Synthetic Organic Chemistry at the Washington State University, USA. He completed his postdoctoral work at the University of Montreal, Canada under the guidance of Prof. Stephen Hannesian. Dr. Laksiri Weerasinghe is currently a senior research scientist at the Sri Lanka Institute of Nanotechnology (SLINTEC). He leads the synthetic organic and pharmaceutical program there and his independent research is focused on Natural product synthesis, new synthetic methodologies, structure-based drug design, and synthesis, antimicrobial peptides, controlled and targeted drug delivery using nano-carriers and the chemical modifications of graphene oxide for catalytic applications.*

Cover Page

The picture illustrating the theme "**Advances in Electrochemical Technology**" was adapted from the "To boost Lithium – Ion Battery Capacity by up to 70%, Add Silicon" article by David Schneider which appeared in the IEEE Spectrum website on 6th January 2019 which discusses about Silicon rich anodes will let batteries hold more energy. This article can be found using this URL https://spectrum.ieee.org/energy/renewables/to-boost-lithiumion-battery-capacity-by-up-to-70-add-silicon