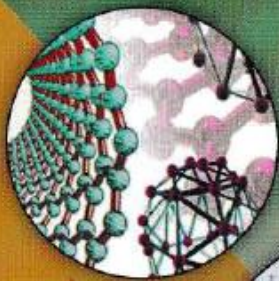


# International Conference on Materials, Energy, Environment and Engineering (ICMEEE)-2020

*Book of Abstracts*



*Organized by*

**Department of Chemical Engineering**

Jashore University of Science and Technology

Jashore-7408, Bangladesh

# **International Conference on Materials, Energy, Environment and Engineering (ICMEEE)-2020**

## ***Book of Abstracts***

All the keynote papers and abstracts in this book of the international conference on Materials, Energy, Environment and Engineering are contribution made by the authors participating in the conference. Therefore, the content written herein reflects those of the authors and do not necessarily constitute endorsement by the editors, organizers of the conference. The entire abstract presented in this book has been peer-reviewed for the content and their suitability for presentation at the conference. The editors and organizers are not liable to any claim arising from the technical content in this book.

Editors

**Dr. Md. Zaved H Khan**

Dr. Rajesh Kumar Chanda

Owaleur Rahman



### Message

I am glad to know that the Department of Chemical Engineering, Jashore University of Science and Technology, Jashore is going to organize a virtual conference entitled “International Conference on Materials, Energy, Environment and Engineering” (ICMEEE-2020).

Research is important for the progress of human civilization and this conference will certainly contribute to that need. Therefore, this conference will facilitate the participants to expose and share their various novel ideas at the international level. With the participation of both academicians and practicing engineers, I hope it will go a long way to fulfill the goals set up by the nation towards self-sufficiency from the point of view of planning, designing, manufacturing, operating, and control of the system as a whole.

Organizing an international conference requires a lot of painstaking efforts. It needs a vision, mission, and hard work to accomplish such an event. I appreciate the effort of the Department of Chemical Engineering and organizing committee in planning and arranging this international conference.

I am sure that the outcome from the deliberations and discussions in this international conference will go a long way in the substantial growth of research and development finally, I would like to extend my best wishes for the success of the event achieving its objective.

Professor Kazi Shahidullah  
Chairman  
University Grants Commission of Bangladesh  
Sher-E-Bangla Nagar, Dhaka-1207.



### Message

It's a great pleasure and privilege to welcome all delegates and participants to the conference entitled "International Conference on Materials, Energy, Environment and Engineering (ICMEEE)-2020" which is organized by the Department of Chemical Engineering under the faculty of Engineering and Technology of Jashore University of Science and Technology (JUST). The conference committee did its utmost to prepare the valuable program. An important defining characteristic of our conference is it is multidisciplinary, as it includes chemists, engineers, and researchers from various fields. All of these provide a unique platform for communication and cooperation with colleagues from various professions, national or international universities and institutes from various regions of the world.

ICMEEE-2020 is befallen in the JUST campus which was established in 2007 by the Shadhinota Shorok (Independence Road) in the Jashore district. The Department of Chemical Engineering (ChE) started its journey from the session of 2009-2010. Within a very short period, ChE department has demonstrated its outreach excellence in research and other progressive activities. I strongly believe that this department will play a significant role to fulfill the vision of JUST by producing Engineering and Technology based efficient manpower and enlightened citizens. As the Chief Patron of the conference committee, I am honored to greet all members of the conference committee and must thank all the conference attendees for showing interest in ICMEEE-2020. I would like to give special appreciation to the secretary for arranging such a type of innovative virtual conference in JUST during the moment of COVID-19. I hope that it will be an enjoyable platform for sharing your research data and projects regarding material science, energy, environment, engineering and technology as well as advanced techniques with all participants through ICMEEE-2020 at JUST.

Have a great conference time in the Department of Chemical Engineering of JUST.

Professor Md. Anwar Hossain, PhD

Chair, ICMEEE-2020

&

Vice Chancellor

Jashore University of Science and Technology

Jashore-7408





### Message

It is my great pleasure to welcome you all to the **International Conference on Materials, Energy, Environment and Engineering (ICMEEE) 2020**. We know that materials, energy, environment, industries, manufacturing, etc. have been playing vital roles in achieving Sustainable Development Goals (SDGs). In order to substantiate sustainable development and innovations, stakeholders and researchers need to collaborate focusing the goals. However, till now, many of those research communities are not interconnected. Hence it is badly needed to bring them together to ensure and expedite optimum development goals. This conference aims to serve this purpose. I hope that, this international conference will pave the way for exchanging innovative ideas, latest information and experiences among academics, researchers, specialists, engineers, environmental scientists, entrepreneurs and students. It also can promote cooperation and networking amongst the practitioners and researchers involved in addressing green infrastructure and environmental issues.

Lastly, I would like to thank the valued sponsors for their spontaneous and significant support for this conference, the organizing committee, and all students who have been working very hard to organize this event, and the participants. I hope this conference will usher in new hope in creating new era of holistic development and achieving the SDGs.

Dr. A.S.M. Mojahidul Hoque  
Dean  
Faculty of Engineering and Technology  
Jashore University of Science and Technology  
Jashore 7408, Bangladesh



### Message

Welcome to the conference entitled “International Conference on Materials, Energy, Environment, and Engineering” organized by the Department of Chemical Engineering, Jashore University of Science & Technology (JUST), Jashore, Bangladesh. I would like to express my deepest appreciation to the authors whose technical contributions are presented in these proceedings. It is because of their excellent contributions and hard work that we have been able to prepare these proceedings. The significance of the research presented in this conference represents a step further towards maturity in science and technology.

I would like to thank all our keynote speakers who made all the efforts to deliver distinguished talks. I would also like to thank all our oral and poster presenters for their great efforts in delivering interactive and excellent tutorials that address the learning needs of all levels, undergraduates, graduates, and professionals. We are very grateful to our track chairs for their great efforts in reviewing the papers in their tracks and organizing to assign other volunteer reviewers, the conference technical program committee members, and the designated reviewers. Finally, I hope that the participants enjoy the outstanding conference program in online platform.

Warm Regards,  
Dr. Md. Zaved Hossain Khan  
Chairman & Associate Professor  
Department of Chemical Engineering  
Jashore University of Science and Technology.  
Jashore-7408.



### Message

I have the honor and pleasure to welcome you all in the “**International Conference on Materials, Energy, Environment and Engineering (ICMEEE 2020)**” on 29 and 30 November, 2020 organizing by the Department of Chemical Engineering under the Faculty of Engineering and Technology of Jashore University of Science and Technology (JUST), Jashore- 7408, Bangladesh which is held by Remote owing to the current worldwide Covid- 19 pandemic.

I would like to remind you that the ICMEEE 2020 following the success and huge response of the previous conference on “International conference on Green Chemistry for Sustainable Development (GCSD)” held on 15 July, 2012 organized by the Department of Chemical Engineering, JUST, has certainly been increased keenness for the current conference. In this conference, 146 abstracts of technical papers were submitted. After screening and Covid threat, 50 papers have been finalized for oral presentation. The conference program also encompasses two plenary lectures and four keynote speeches from renowned speakers of home and abroad including 08 technical sessions.

I would like to express my gratitude for the plenary & keynote speakers, reviewers, paper presenters, participants and the rest associated with this conference due to their encouragement, contribution and support for the success of this conference and to make a memorable event. I truly believe that this conference will provide you with a unique opportunity to refresh your knowledge and explore in different engineering fields and prepare you to face very important challenges on the energy demand and environment change and how to achieve the sustainable development goals. I wish all the participants a great conference and good health where you stay.

Dr. Md. Wasikur Rahman  
Conference Secretary, ICMEEE 2020 and  
Associate Professor  
Department of Chemical Engineering  
Jashore University of Science and Technology  
Jashore- 7408, Bangladesh

## Opening Ceremony (29/11/2020)

Log in: 9.30 AM-10.00 AM

Time	Speaker
10.00 AM -10.10 AM	Conference secretary
10.10 AM -10.15 AM	Chairman, ChE, JUST
10.15 AM -10.20 AM	Dean, Engineering faculty, JUST
10.20 AM -10.30 AM	Vice chancellor, JUST
10.30 AM -10.40 AM	UGC chairman
11.00 AM -11.30 AM	Planer speaker-1 (Dr. Md. Akhtarul Islam)
11.30 AM -12.00 AM	Planer speaker-2 (Dr. Syeda Sultana Razia)

## Program Schedule (29/11/2020)

Time	Session
2.00 PM-2.20 PM	keynote session-1 (Md. Maksudur Rahman Khan)
2.20 PM-2.40 PM	keynote session-2 (Mohammad Mizanur Rahman Khan)
2.45 PM-4.15 PM	Session-1 (Food, Health and Safety)
2.45 PM-4.15 PM	Session-2 (Energy and Conversion Systems)
2.45 PM-4.15 PM	Session-3 (Advance Material and its Application)

## Program Schedule (30/11/2020)

Time	Session
10.00 AM -10.20 AM	keynote session-3 (Professor Dr. Nowshad Amin)
10.20 AM -10.40 AM	keynote session-4 (Dr. Md. Aminur Rahman)
11.00 AM- 12.30 PM	Session-4 (Environment and Waste Management)
11.00 AM- 12.30 PM	Session-5 (Advanced Engineering)
11.00 AM- 12.30 PM	Session-6 (Advance Material and its Application)
11.00 AM- 12.30 PM	Session-7 (Materials Synthesis and Analysis)
11.00 AM- 12.30 PM	Session-8 (Polymer and Fiber Technology)
1.00 PM-1.10 PM	Closing session



Date: 29 November 2020, Time: 2.45 PM-4.15 PM

**Session-01: Food, Health and Safety**

Session Chair: Professor Dr. Biplob Kumar Biswas, Department of ChE, JUST

Paper ID	Presenter	Email	Title, Authors, Affiliation
ICMEEE-PI-514	Md. Abu Sadath	abusadath98@gmail.com	Assessment of Vulnerability to Fire Hazard of RDA market in Rajshahi City. Md. Abu Sadath, Farhana Afroz, Fahim Shahriar Sakib, Department of Urban & Regional Planning, Rajshahi University of Engineering & Technology, Rajshahi-6204, Bangladesh
ICMEEE-PI-541	Mahabub Alam	m.alam@student.sust.edu	Effect of edible coating on physicochemical properties and nutritional compounds retention of air dried green banana. Mahabub Alam, Animesh Sarkar, Department of Food Engineering and Tea Technology, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh
ICMEEE-PI-553	Sharifa Shariff Nijhum	sh21nijhum@gmail.com	Effect of pre-treatments on osmotic-air drying of guava. Sharifa Shariff Nijhum, Ritika Mahmuda, Pabitra Chandra Das, Department of Chemical and Food Process Engineering, Rajshahi University of Engineering & Technology, Rajshahi-6204, Bangladesh.
ICMEEE-PI-555	M. M. Mahdi Hasan	mahdi.jawad95@gmail.com	Effects of Various Osmotic and Chemical Pretreatment Methods on Drying Kinetics and Physicochemical Properties of Tomatoes ( <i>Solanum lycopersicum</i> ). M. M. Mahdi Hasan., Rowshon Ara., Md. Ruslan Mehadi Galib, Department of Food Engineering and Tea Technology, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh
ICMEEE-PI-559	Khandaker Nabil Ahmed	himelhimel8@gmail.com	Fire Risk Assessment of Residential High-Rise Building in Khulna City. Khandaker Nabil Ahmed and Fahim Shahriar Sakib, Department of Civil Engineering, Khulna University of Engineering and Technology, Khulna-9203, Bangladesh
ICMEEE-PI-607	Md. Abdullah-Al-Mamun	lokmanhosen@pg.chem.buet.ac.bd	Pollution Characteristics And Health Risk Assessment Of Heavy Metals In Vegetables Grown In Contaminated Soil At Industrial Areas Of Savar, Dhaka. Md. Abdul Goni, Lokman Hosen, Md. Abu Shamim Khan, Mizanur Rahman, Md. Abdullah-Al-Mamun, Department of Chemistry, Bangladesh University of Engineering and Technology. Dhaka-1000;
ICMEEE-PI-630	Md. Matiar Rahman	matiurchem40@gmail.com	The Amount Of The Micronutrients In Vegetables, Soils And River Water Of Gopalganj, Bangladesh. Md. Matiar Rahman, Md. Mahedi Hassan & Nayan Mony Shovo, Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj-8100, Bangladesh

Date: 29 November 2020, Time: 2.45 PM-4.15 PM

**Session-02: Energy and Conversion Systems**

Session Chair: Dr. Md. Wasikur Rahman, Associate Professor, Department of ChE, JUST

Paper ID	Presenter	Email	Title, Authors, Affiliation
ICMEEE-PI-522	Sk. Shahriar Bin Rasul	sbrasul@gmail.com	Characterization of dried fecal sludge from urban waste to investigate its energy valorization. Sk. Shahriar Bin Rasul, Md. Wasikur Rahman, Jashore University of Science and Technology, Department of Chemical Engineering, Jashore– 7408, Bangladesh
ICMEEE-PI-528	Mahade Hassan Onik	Mahadeonik96@gmail.com	Dry anaerobic digestion process for biomethane production. Abu Yousuf, Md. Shahadat Hossain, Md. Anisur Rahman, Mamal Uddin, Tahmid ul Karim, and Mahade Hassan Onik, Department of Chemical Engineering and Polymer Science, Shahjalal University of Science and Technology, Sylhet, Bangladesh
ICMEEE-PI-601	Md Sabbir Ahmed	sabbirchejust@gmail.com	Preparation of liquid fuel from scrap tubes through thermal pyrolysis method. Selim Reja, Md. Sabbir Ahmed, Md. Wasikur Rahman, Department of Chemical Engineering, Jashore University of Science and Technology, Jashore- 7408, Bangladesh
ICMEEE-PI-603	Islam Uddin Shipu	islamshipu68@gmail.com	Production of biodiesel from waste animal fats. Islam Uddin Shipu, Animesh Kumar Biswas, Salma A. Iqbal, Abu Yousuf, Md. Anisur Rahman, Md. Shahadat Hossain, Department of Chemical Engineering and Polymer Science, Shahjalal University of Science and Technology, Sylhet, 3114, Bangladesh
ICMEEE-PI-609	Md. Mahmud	mahmudkoli11@gmail.com	Review on Biofuel Production Process from Biomass. Md. Mahmud, Zakia Sonia, Md Mosaddek Hossen, Department of Applied Chemistry and Chemical Engineering, Bangabandhu Sheikh Mujibur Rahman Science & Technology University, Gopalganj, Bangladesh.
ICMEEE-PI-637	Yousuf Ali	Yousuf.ali.jstu@gmail.com	Preparation of Jute Stick-based Activated Carbon Supported Copper Oxide Nanoparticles for Hydrogen Storage in MgH <sub>2</sub> towards Automobile Application. Yousuf Ali, Md. Sohel Rana, Hasnat Zahan Soniamoni, Md. Jahangir Alam, Md. Wasikur Rahman, Dept. of Chemical Engineering, Jashore University of Science and Technology
ICMEEE-PI-638	Md. Shamim Hasan	shamimacce046@gmail.com	Review on Production of the Jet Fuel from Plastic Waste by Catalytic Pyrolysis Process. Md. Shamim Hasan, M. Mehedi Hasan, Department of Applied Chemistry and Chemical Engineering, Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Bangladesh.

Date: 29 November 2020, Time: 2.45 PM-4.15 PM

**Session-03: Advance Material and its Application**

Session Chair: Dr. Md. Zaved H. Khan, Associate Professor and Chairman, Department of ChE, JUST

Paper ID	Presenter	Email	Title, Authors, Affiliation
ICMEEE-PI-547	Nayem Ahmed	nayemahmed2010@gmail.com	Identification of Rheological Model for KCl-Glycol-PHPA Mud Blended with Iron (III) Oxide Nanoparticles. Md. Saiful Alam , Nayem Ahmed , M. A. Salam, Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh
ICMEEE-PI-548	Md. Ala Uddin	alauddin.ce.buet@gmail.com	Effect of Cast in Delay and Evaporation on Compressive Strength of Concrete. Md. Aminul Islam, Md. Ala Uddin, Md. Jakiul Alam Chy, BUET-Japan Institute of Disaster Prevention and Urban Safety, Bangladesh University of Engineering and Technology (BUET), Dhaka-1000.
ICMEEE-PI-561	Sanwar Hossain	kuetsanwar@gmail.com	Fabrication of pH sensor based on polyaniline modified nickel foam. Mirana khanom, Sanwar Hossain and Mamun Jamal, Department of Chemistry, Khulna University of Engineering & Technology, Bangladesh
ICMEEE-PI-570	Mohammad Shamsul Islam	shepon086@yahoo.com	Heterogeneous Techniques for Identification of Lung Cancer. Mohammad Shamsul Islam ,Md. Biddut Hossain ,Md. Tuhin Reza, Dept. of Computer Science & Engineering, Sylhet Engineering College, Sylhet, Bangladesh.
ICMEEE-PI-577	Md. Jahidul Haque	mjh.ruet26@gmail.com	Improved structural and electrical properties of Mg-doped BaTiO <sub>3</sub> ceramics for energy storage applications. Md. Jahidul Haque, Mst. Sharmin Mostari, Sunbeam Rahman Ankur, Department of Glass & Ceramic Engineering, Rajshahi University of Engineering & Technology (RUET), Rajshahi-6204, Bangladesh
ICMEEE-PI-580	G. M. Sadrul Islam	gmsadrulislam0708@gmail.com	Manufacturing & Characterization of Glass Samples with Three Different Sources of Silica: Possible Alternatives for Quartz in Glass Manufacturing. G. M. Sadrul Islam, Mainul Islam, Shamima Akther Urmi, M.S. Rahman, Department of Glass & Ceramic Engineering, Rajshahi University of Engineering & Technology, Rajshahi-6204, Bangladesh.
ICMEEE-PI-581	A. H. M. Asif Kamal	ahmasifkamal@gmail.com	Mechanical Properties of Waste Jute and Cotton Fiber Reinforced Hybrid Polypropylene Composites. A. H. M. Asif Kamal and Mahbub Hasan, Department of Materials and Metallurgical Engineering, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh

Date: 30 November 2020, Time: 11:00 AM – 12:30 PM

**Session-04: Environment and Waste Management**

Session Chair: Professor Dr. Biplob Kumar Biswas, Department of ChE, JUST

Paper ID	Presenter	Email	Title, Authors, Affiliation
ICMEEE-PI-501	Sk. Shahriar Bin Rasul	sbrasul@gmail.com	An overview of integrated urban waste management in Bangladesh and potential source of renewable energy for future sustainability. Sk. Shahriar Bin Rasul, Md. Wasikur Rahman, Jashore University of Science and Technology, Department of Chemical Engineering, Jashore– 7408, Bangladesh
ICMEEE-PI-515	Abdullah-Al-Mamun	mdabdullahalmamun@pg.chem.buet.ac.bd	Accumulation And Mobilization Of Heavy Metals In Fishes Grown In Industrial Contaminated Water Of Savar, Dhaka. Md. Abdul Goni, Md. Abdullah-Al-Mamun, Md. Abu Shamim Khan, Mizanur Rahman, Lokman Hasan, Department of Chemistry, Bangladesh University of Engineering and Technology. Dhaka-1000;
ICMEEE-PI-535	Hridoy Roy	hridoyroyprottoy875@gmail.com	Effects of Microwave Irradiation on adsorption capacity of Burmese grape ( <i>Baccaurea Ramiflora</i> ) seeds in the removal of methylene blue from waste water. Hridoy Roy, Yeasin Arafat Tarek, Ehsanur Rahman, Shoeb Ahmed, Shakhawat H. Firoz, Department of Chemical Engineering, Bangladesh University of Engineering and Technology, Bangladesh
ICMEEE-PI-550	Md. Mortuza Ahmmed	Mortuza123034@gmail.com	Environmental Factors of Climate Change in Bangladesh Over the Years. Md. Mortuza Ahmmed, Assistant Professor, Department of Mathematics, American International University – Bangladesh (AIUB).
ICMEEE-PI-564	Md. Babul Miah	babul.bsmrstu16@gmail.com	Geographical Data Analysis of CO <sub>2</sub> Emissions Applying GIS in South Asia. Md. Babul Miah, Md. Mahmud, Department of Environmental Science and Disaster Management, Bangabandhu Sheikh Mujibur Rahman Science & Technology University, Gopalganj, Bangladesh.
ICMEEE-PI-612	Saifullah Bin Ansar	kuetsiam30@gmail.com	Roadside Solid Waste Management System: A Case Study On Islam Nagar Road at the Eastern Side of Khulna University in 2019. Saifullah Bin Ansar and Gitisree Biswas. Department of Urban and Regional Planning, Khulna University of Engineering & Technology (KUET), Khulna -9203, Bangladesh.
ICMEEE-PI-639	Md Golam Mostofa Salim	gmostofa5853@gmail.com	Eco-Friendly Nonconventional Adsorbents to Mitigate Toxic Metals and Organic Pollutants from Industrial Wastewater. Md. Golam Mostofa, Abdul Quader and Md. Wasikur Rahman, Environmental Science, Bangladesh University of Professionals, Mirpur Cantonment, Dhaka-1216, Bangladesh, Department of Chemistry, University of Dhaka, Bangladesh, Department of Chemical Engineering, Jashore University of Science and Technology, Jashore- 7408, Bangladesh.

Date: 30 November 2020, Time: 11:00 AM – 12:30 PM

**Session-05: Advanced Engineering**

Session Chair: Dr. Md. Wasikur Rahman, Associate Professor, Department of ChE, JUST

Paper ID	Presenter	Email	Title, Authors, Affiliation
ICMEEE-PI-526	Tuhin Reza	tuhinjstucse@gmail.com	Cloud desktop based ICT cell: An application of Virtual Desktop Infrastructure (Cloud computing). Md. Tuhin Reza , Md. Biddut Hossain, Mohammad Shamsul Islam, Dept. of Computer Science and Engineering, Jashore University of Science & Technology, Jashore-7408
ICMEEE-PI-531	M. S. Rabbi	rabbi@cuet.ac.bd	Design And Analysis Of Structural And Thermal Properties Of Different Disc Brake Rotors. M. H. Pranta, M. S. Rabbi, Department of Mechanical Engineering, Chittagong University of Engineering and Technology, Chattogram-4349, Bangladesh
ICMEEE-PI-532	Md. Ala Uddin	alauddin.ce.buet@gmail.com	Damage Evaluation Due to Effects of Creep of a Thick Cylinder Model Made of Modified Grade 91 Steel. Md. Ala Uddin, Nazrul Islam, Md. Sumon Hossain, Department of Civil Engineering, Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh.
ICMEEE-PI-631	S. M. Fahian Bayezeed	shihabahammed4976@yahoo.com	Thermal Conductivity Calculation of Black Phosphorene Monolayer: An NEMD (Non-Equilibrium Molecular Dynamics) Study. Hasib Mahmud Tuhin, S. M. Fahian Bayezeed, Shihab Ahammed Department of Electrical & Electronic Engineering, Bangabandhu Sheikh Mujibur Rahman Science & Technology University, Gopalganj-8100, Bangladesh.
ICMEEE-PI-632	Zubayer Ahmed Hridoy	shihabahammed4976@yahoo.com	Thermal Transport Characterization of Stanene by Non-equilibrium Molecular Dynamics (NEMD). Kazi Sazzad Hossen, Zubayer Ahmed Hridoy and Shihab Ahammed, Department of Electrical and Electronic Engineering, Bangabandhu Sheikh Mujibur Rahman Science & Technology University, Gopalganj-8100, Bangladesh.
ICMEEE-PI-640	Md. Jahidul Hasan	jahidufu@gmail.com	Screening of Shrimp at Different Stages in Different Regions for Identification of Prohibited Antibiotic Residue, Md. Jahidul Hasan <sup>1*</sup> , M. Aminur Rahman <sup>2*</sup> , Md. Shamim Parvez <sup>3</sup> and Papia Saha <sup>4</sup> . <sup>1</sup> Quality Control Laboratory, Department of Fisheries, Ministry of Fisheries and Livestock, Bangladesh. <sup>2</sup> Department of Fisheries and Marine Bioscience, Faculty of Biological Science and Technology, Jashore University of Science and Technology, Jashore-7408, Bangladesh. <sup>3</sup> Kranti Associates Ltd. Adabor, Dhaka-1207, Bangladesh. <sup>4</sup> Ex MS Student, Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna-9208, Bangladesh.
ICMEEE-PI-641	Md. Shamim Parvez	parvezmdshamim@gmail.com	Influences of different microalgal diets on the survival and growth of an edible sea urchin <i>Tripneustes gratilla</i> (Linnaeus, 1758) larvae in captivity, Md. Shamim Parvez <sup>1*</sup> , M. Aminur Rahman <sup>2*</sup> , Fatimah Md. Yusoff <sup>3</sup> and Aziz Arshad <sup>3</sup> , <sup>1</sup> Kranti Associates Ltd. Adabor, Dhaka-1207, Bangladesh, <sup>2</sup> Department of Fisheries and Marine Bioscience, Faculty of Biological Science and Technology, Jashore University of Science and Technology, Jashore-7408, Bangladesh, <sup>3</sup> Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

Date: 30 November 2020, Time: 11:00 AM – 12:30 PM

**Session-06: Advance Material and its Application**

Session Chair: Dr. Md. Zaved H. Khan, Associate Professor and Chairman, Department of ChE, JUST

<b>Paper ID</b>	<b>Presenter</b>	<b>Email</b>	<b>Title, Authors, Affiliation</b>
ICMEEE-PI-582	Adib Al Azad	adib.azad.14@gmail.com	Mechanical Properties of Coir and Nylon Fiber Reinforced Hybrid Polypropylene Composites. Adib Al Azad, Arif Hossain Asif and Mahbub Hasan, Department of Materials and Metallurgical Engineering, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh
ICMEEE-PI-593	Fatema Khatun	lubna.pme71@gmail.com	Preparation of Au decorated TiO <sub>2</sub> nanotube arrays as proficient visible light active catalyst for photocatalytic conversion of CO <sub>2</sub> to CH <sub>4</sub> . Fatema Khatun, Md. Minhaj Uddin Monir, Lan Ching Sim and Azrina Abd Aziz, Department of Petroleum and Mining Engineering, Jashore University of Science and Technology, Jashore-7408, Bangladesh
ICMEEE-PI-599	B.A.Johan	1506012@student.ruet.ac.bd	Physio-Mechanical behavior of different types of local and imported clays as a raw material used in traditional ceramic body preparation. Md. Mintu Ali, B.A.Johan, M. Shohan Ali, M. Humayan Kabir, M.A. Kaiyum, M. Khairul Islam, M.S Rahman, Department of Glass & Ceramic Engineering, RUET, Rajshahi-6204, Bangladesh
ICMEEE-PI-604	Md. Eyazul Haque	haque.eyazul@gmail.com	Physicochemical and Mechanical Properties of Natural Fiber Reinforced Thermoplastic Nano-composites. Md. Eyazul Haque, Md. Wahab Khan, Department of Chemistry, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh
ICMEEE-PI-617	Md. Sohel Rana	soel.bau@gmail.com	Sodium Alginate based biodegradable food packaging materials: A Review. Md. Sohel Rana , Md.Wasikur Rahman, Dept. Of Chemical Engineering, JUST
ICMEEE-PI-636	Hasnat Zahan Sonia	soniamonijstu@gmail.com	Review on Biosynthesis of SnO <sub>2</sub> nanoparticles by chemical precipitation method, Hasnat Zahan Sonia , Sumaya Tarannum Nipa, Rumana Akter, Md. Al Raihan, Sk. Shahriar bin Rasul, Md. Sohel Rana, Md. Yousuf Ali, Md.Wasikur Rahman, Dept. Of Chemical Engineering, Jashore University of science and Technology, Jashore-7408, Bangladesh



Date: 30 November 2020, Time: 11:00 AM – 12:30 PM

**Session-07: Materials Synthesis and Analysis**

Session Chair: Dr. S.M. Nur Alam, Department of ChE, JUST

<b>Paper ID</b>	<b>Presenter</b>	<b>Email</b>	<b>Title, Authors, Affiliation</b>
ICMEEE-PI-557	Shehab Shahreyar	saifulislammesal@gmail.com	Evaluating mineral medium composition in performance of denitrification. Shehab Shahreyar, Saiful Islam, Md Salatul Islam Mozumder , Department of Chemical Engineering & Polymer Science, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh.
ICMEEE-PI-578	Saiful Islam	saifulislammesal@gmail.com	Interference of minerals on the UV-spectrophotometric determination of ammonium, nitrite, nitrate and phosphate. Saiful Islam, Shehab Shahreyar, Md. Salatul Islam Mozumder, Department of Chemical Engineering and Polymer Science, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh
ICMEEE-PI-598	Supreya Singha Roy	supreyasingharoy@gmail.com	Phytochemical screening and antimicrobial activities analysis of Catharanthus roseus. Prof. Dr. Md. Atiqur Rahman, Supreya Singha Roy, Dr. Md. Mafizur Rahman, Department of Applied Chemistry and Chemical Engineering, Islamic University , Kushtia-7003
ICMEEE-PI-605	Md. Khairul Islam	ikhairul277@gmail.com	Preparation and Characterization of Activated Carbon from Tea Waste by Chemical Activation Method. Md. Khairul Islam , Md. Rayhan Chawdhuri , Shamima Akhtar Urmi , Md. Mintu Ali , Md. Humayun Kabir , Md. Abdul Kaiyum, Dept. of Glass & Ceramic Engineering (GCE), Rajshahi University of Engineering & Technology (RUET), Rajshahi-6204, Bangladesh.
ICMEEE-PI-621	Md. Saiful Islam	saifulislam.chemistry@gmail.com	Synthesis, Characterization and Application of Amberlite XAD-4 Resin Functionalized with N-Salicylidene Anthranilic Acid for Preconcentration and Separation of Zinc in Aqueous Solution. Md. Saiful Islam and Nurun Nahar, Department of Chemistry, Jahangirnagar University, Savar, Dhaka- 1342, Bangladesh.
ICMEEE-PI-623	Md. Abu Saeed	saeedroyal555@gmail.com	Synthesis of cellulose acetate from different agricultural wastes by trans-esterification reaction. Md. Abu Saeed, Md. Eleas Hossain, Md. Minhaz-Ul Haque, Applied Chemistry and Chemical Engineering Department, Islamic University, Kushtia, Bangladesh.

Date: 30 November 2020, Time: 11:00 AM – 12:30 PM

**Session-08: Polymer and Fiber Technology**

Session Chair: Dr. Md. Jahangir Alam, Associate Professor, Department of ChE, JUST

<b>Paper ID</b>	<b>Presenter</b>	<b>Email</b>	<b>Title, Authors, Affiliation</b>
ICMEEE-PI-509	Tarikul Islam	nafistextile@gmail.com	A Study on Mechanical Properties of Carbon Fiber Reinforced Polymer Composite. Nasif Chowdhury, GM Faysal, Tarikul Islam, Habibur Rahman and Farjana Yeasmin, Department of Textile Engineering, Anwer Khan Modern University, Dhaka-1230, Bangladesh, Department of Textile Engineering, Jashore University of Science and Technology, Jashore-7408, Bangladesh, Department of Agro Product Processing Technology, Jashore University of Science and Technology, Jashore-7408, Bangladesh
ICMEEE-PI-524	Tanzila Hasan Moyuri	tanzilahasan25@gmail.com	Composition of aromatic biomarkers in Gondwana shales, Bangladesh. Tanzila Hasan Moyuri, H. M. Zakir Hossain, Md. Mahfuj Hossen, Department of Petroleum and Mining Engineering, Jashore University of Science and Technology, Jashore 7408, Bangladesh
ICMEEE-PI-537	Md. Saiful Islam	mahbubh@mme.buet.ac.bd	Effect of Acrylonitrile Treatment on Properties of Kenaf Fiber Reinforced Polypropylene Biocomposites. Md. Saiful Islam, Muhammad Abdul Mun'aim Bin Mohd Idrus and Mahbub Hasan, Department of Chemistry, Bangladesh Army University of Engineering and Technology, Natore, Bangladesh
ICMEEE-PI-552	G. M. Sadrul Islam	gmsadrulislam0708@gmail.com	Effects of Different Natural Fiber Waste on Morphological, Physical & Mechanical Properties of Epoxy Based Polymer Matrix Composites, G. M. Sadrul Islam, A. H. Munna, M. Humayan Kabir, Department of Glass & Ceramic Engineering, Rajshahi University of Engineering & Technology, Rajshahi- 6204, Bangladesh.
ICMEEE-PI-554	Wasim Khan	wasimmebuet@gmail.com	Effect of Human Hair and Copper Wire Hybridization on the Properties of Polypropylene Composites. Md Zunayed Khan, Md Wasim Khan and Mahbub Hasan, Department of Materials and Metallurgical Engineering, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh
ICMEEE-PI-566	Abdul Kaium Sayem	sayemburtmme@gmail.com	Glass and Nylon Fiber Enhanced Hybrid Polypropylene Composites. Abdul Kaium Sayem, Md Akib Bin Rashid and Mahbub Hasan, Department of Materials and Metallurgical Engineering, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh
ICMEEE-PI-592	Dr. Md. Anwarul Karim	makarim72@ru.ac.bd, makarim72@gmail.com	Poly (vinylidene fluoride-hexafluoropropylene) -based Composite Membrane with TiO <sub>2</sub> for Direct Methanol Fuel Cells Application, Md. Anwarul Karim, and Sharmin Sultana Dipti, School of Energy, Materials and Chemical Engineering, Korea University of Technology and Education, Byongcheon-myeong, Cheonan 330-708, Republic of Korea.

International Conference on Materials, Energy, Environment and Engineering

Plenary Lecture 01

## **Chemical Engineering Education and Research: Prospects and Challenges**

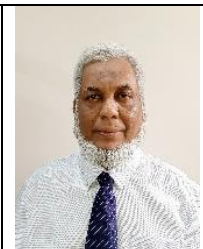
Dr. Md. Akhtarul Islam

Professor

Dept. of Chemical Engineering and Polymer Science

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Sylhet- 3114



### **Abstract**

This lecture deals with the growth of chemical engineering as an academic discipline, and prospects and challenges before chemical engineering graduates in developing career as professional or researcher in regional and global aspects. It describes chemical engineering as a specialty, and its interrelation with other branches of engineering. The emergence and growth of chemical engineering as a separate branch through the centuries have been briefly re-visited, and the frontiers of chemical engineering in countries with different level of development has been overviewed. The Academia-industry collaboration in developed world has been outlined and the deficiency of such relation in our country along with possible remedy has been discussed. Great national and social aspiration to engineering profession in our country in contrast to reluctance to the same of young generation of developed nations (providing special incentive to “STEM” education program) has been indicated as a golden opportunity for engineering graduates in global job market. For recognition of engineering degree worldwide, it is recommended that the chemical engineering programs in our country must be approved by a competent accreditation institution. The researches in our engineering institutions has been compared with those in world renowned institutions, and the differences in the need and approaches of the developed and developing nations to contribute to the national economy have been identified. Some recommendations have been given for enhancing researches contributing to national development.

## **Short Autobiography**

Dr. Md. Akhtarul Islam

Professor, Dept. of Chemical Engineering and Polymer Science

Shahjalal University of Science and Technology

Sylhet- 3114

### **Birth and Education**

- Born on September 11, 1959 in Santahar, Bogra
- Passed SSC examination in 1974 securing 10<sup>th</sup> position in Rajshahi Board
- Passed HSC examination in 1976 securing 4<sup>th</sup> position in Rajshahi Board
- Completed 5 years' Chemical Engineering program (1979-1984) from Bourgas University "Prof. Dr. Asen Zlatarov", Bulgaria
- Completed PhD in 1990 from Higher Certifying Commission, Bulgaria

### **Command of Language**

Bangla, Bulgarian, English, German

### **Member of Professional bodies**

Institute of Engineers Bangladesh (IEB), Bangladesh Mathematical Society (Ganit Samitee), Bangladesh Chemical Society

### **Member of Alumni Association**

Association of Humboldt Fellows Bangladesh, Alumni Association of German Universities in Bangladesh

### **Research Interests**

Membrane technology, Water and wastewater treatment technology, Air-pollution monitoring, Sensor development, Polymer rheology, Modeling of polymer deformation, Gas flow through capillaries, Thermally conductive-electrically insulating material development

### **Published materials**

Around 140 research papers, and possesses 1 patent

## **Towards a Sound Chemical Management System in Bangladesh: An Essential Step to Protect Life and Environment**

### **ABSTRACT**

Bangladesh has observed a significant hike in national import of chemicals and chemical-related products in the past ten years. The country's infrastructure and legal framework development for chemical management, however, could not keep pace with market growth, which is reflected in deadly incidents like the Nimtoli fire (2010), Tampaco fire (2016), DAP ammonia release (2016), and very recently the Old Dhaka fire (2019) in Chawkbazar that involved chemicals. Since the Old Dhaka 2019 fire, public concern regarding chemical safety has heightened, and government agencies and industry are showing interest for a better chemical safety and management system at the national and organizational levels to keep employees, communities, and the environment safe.



In this paper the big picture of national chemical management of Bangladesh based on the analysis of existing regulatory framework will be presented. Essential elements of a national chemical management system will be discussed in light of international guidelines and best practices. Finally, priority areas that need immediate government attention and long-term commitment will be identified and elaborated.

**Dr. Syeda Sultana Razia** is a Professor and the Head of the Department of Chemical Engineering, Bangladesh University of Engineering and Technology (BUET). She has been appointed as member of Scientific Advisory Board of the Organization for the Prohibition of Chemical Weapons (OPCW), The Hague, Netherlands. She had her B.Sc. and M.Sc. in Chemical Engineering, from BUET and Ph.D. in Chemical Engineering from the University of Alberta, Canada. Her expertise includes process safety, chemical safety and security, distillation and separation processes, effluent treatment etc. She has served as an expert in a number of policymaking, investigation and selection committees dealing with technological issues of chemical industries formed by the Government of Bangladesh. She led the work of preparing safety guidelines and safety audit protocol for petroleum products and textile chemicals in Bangladesh. She is also involved in assessing the safety and environmental aspects of different chemical industries in Bangladesh. She is a resource person to the National Authority of Chemical Weapon Convention, Armed Force Division, Bangladesh and has been invited as a speaker in a number of national/international forums on chemical safety issues. She has led collaborations between BUET and Mary Kay O'Connor Process Safety Centre, Texas A& M University System, US. She is a member of Global Advisory Team of Poland based International Center of Chemical Safety and Security (ICCSS).

## **Solar driven carbon dioxide conversion to fuel: recent progress and future**

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### **Abstract.**

Carbon dioxide (CO<sub>2</sub>) is a major inevitable greenhouse gas produced in fossil fuel combustion. The global energy-related CO<sub>2</sub> emissions will grow 0.6% per year from 2018 to 2050. Large amount of CO<sub>2</sub> production leads to the collapse of the natural carbon cycle and accelerate the climate change. Recycling the CO<sub>2</sub> produced from the industries to useful fuel can provide energy in a sustainable way with solving two major problems: global warming and crisis of energy. The idea of converting CO<sub>2</sub> to value added fuel and chemicals comes from nature where photosynthesis occurs in plants by using H<sub>2</sub>O and CO<sub>2</sub> to produce carbohydrate over chlorophyll (catalyst) through utilizing sunlight as the energy source. Taking the example from the nature, the ‘artificial leaf’ concept is developed to produce hydrocarbons or oxygenated hydrocarbons (fuels), where much faster kinetics are required compared to the plants. The artificial photosynthesis can be achieved using photocatalytic (PC), electrocatalytic (EC), photovoltaic-electrocatalytic (PV-EC) and photoelectrocatalytics (PEC) systems. PC and EC pathways for CO<sub>2</sub> conversion have been the subject of extensive research over the past 40 years, whereas the PEC and PV-EC are the integrated technological concepts possessing higher conversion rates and higher efficiencies extensively studied in past 10 years, however the magnitudes of production rates for most studied catalysts or electrodes remain very low, distinctly hindering the success of the solar CO<sub>2</sub> conversion. Despite the works on the design of myriad semiconductors, little attention has been given to the solar CO<sub>2</sub> reactors. For PC system fluidized bed reactors are usually considered for the proton-coupled reduction of CO<sub>2</sub>, while thin-film photo/electrocathodes are used for PEC or EC systems. In all cases the utilization of the light is limited by the light penetration length. The increased turbidity of the reaction mixture may further decrease the efficiency of the reactor which has never been accounted in the existing photoreactors. Solar-driven CO<sub>2</sub> reactors with good mass transfer, photon transfer and the ability for up-scaling need to be developed in order to further improve performance of the processes. Hence, the presentation will concentrate more on the current status of research on particular PC and PEC CO<sub>2</sub> reductions highlighting development of the catalysts. Besides, specific attention will be paid on the mechanism of charge transfer in PEC CO<sub>2</sub> reduction. The issues and challenges identified with the scale up of solar-driven CO<sub>2</sub> conversion technology will also be thoroughly discussed.



## **Fabrication of PVA based semiconductor composite films with superior photocatalytic performance for organic dye removal**

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Bangladesh

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mizan\_su@yahoo.com (M. M. Rahman Khan)

### **Abstract**

The contamination of toxic organic compounds like organic dyes in water bodies affects the aquatic environment and drops the drinking water quality. To optimize such problem, several approaches as well as materials have been applied to remove organic dyes from the contaminated water [1, 2]. In this context, simple preparation of PVA based semiconductor composite films with highly efficient photocatalytic activity for organic dye removal is still a challenging topic. The promising photocatalytic properties using various semiconductor materials such as ZnO, Al<sub>2</sub>O<sub>3</sub> and ZnS with PVA matrix were fabricated through a simple solvent casting method. The photocatalytic performance of the composites was evaluated along with the investigations of their photoluminescence (PL), optical transparency, morphology and thermal properties. The formation of composites as well as the interaction between the PVA and filler semiconducting materials was confirmed by FTIR, UV-Vis and PL spectroscopy. The enhanced luminescence property, better thermal stability and morphological variations were observed in the present work. Such study may give a new insight into the fabrication of PVA-semiconductor photocatalysts for the treatment of organic pollutants intended for water purification.

### **References:**

1. Aarthi T, Madras G (2007) Photocatalytic degradation of rhodamine dyes with nano-TiO<sub>2</sub>. *Industrial & Engineering Chemistry Research* 46 (1):7-14.
2. . Rahman Khan MM, Pal S, et al. (2019) Simple fabrication of PVA–ZnS composite films with superior photocatalytic performance: Enhanced luminescence property, morphology, and thermal stability. *ACS omega* 4:6144-6153.

# **Thin Film Photovoltaic (PV) Technology – Materials, Devices & Way Forward**

Nowshad Amin

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## **Synopsis**

As IEA (International Energy Agency) recently acknowledges solar photovoltaic energy to be the cheapest amongst all, many countries around the world are now convinced to rely on Renewable Energy Sources (RES) for their future energy roadmap. Since the inception of the first solar photovoltaic cell in Bell Labs in 1954, researchers have been working rigorously to achieve utmost benefit in terms of conversion efficiency at the least cost. As a result, mega to giga-watt-peak large-scale solar (LSS) farms, which may be termed as nuclear-power-plant scale solar farms, have become trustworthy reality nowadays. Even though the first generation solar cells, which are mainly crystalline or multi-crystalline silicon based, are still dominating the major market share of around 90%, the search for other options has brought over many other potential candidates such as amorphous silicon, cadmium telluride, copper-indium-sulphide as 2<sup>nd</sup> generation thin film technologies since early 70s. Semiconductor materials and their fabrication technologies in many ways have evolved over the time to support various wings of PV R&D in both traditional or futuristic ways. Some of the thin film photovoltaics are now in regular commercialization stages attributing to their conversion efficiency achievement over 20%. Moreover, new arena has opened up for the most challenging but prospective device structures such as tandem/multi-junctions of various materials. This talk will introduce most prospective thin film solar cells from its inception towards successful commercialization as well as future direction of R&D. This will definitely boost the hope for alternatives amid the imminent energy crisis besides promoting enthusiasm among new generation.

*Keywords:* Solar Photovoltaic Energy Technologies; Solar Cells; Thin films

Keynote lecture 04

## **Adaptation of Fisheries and Aquaculture to Climate Change in the Coastal Areas of Bangladesh: A Holistic Approach**

**M. Aminur Rahman**

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### **Abstract.**

Aquaculture and fisheries are key contributors to food supply, food security and livelihoods in both the national and global standpoints. Aquatic foods including fish, shellfish, seaweeds and seagrasses have high nutritional values and are considered to be the most widely consumed, traded and exported food products for many developing countries. They account for at least 15 percent of animal protein for more than 4 billion people, most in developing countries. Among these countries, Bangladesh is the most at risk to the effects of climate change and its coastal area is most vulnerable. Owing to their potentially vast reach and scale, the impacts of climate change embody a critical challenge for fisheries and aquaculture, and the livelihood of many coastal countries including Bangladesh, most specifically the fishing communities living close to these resources. The aquaculture and fisheries sector in the coastal areas is subjugated by export-oriented saltwater shrimp (*Penaeus monodon*) and freshwater prawn (*Macrobrachium rosenbergii*) farming. However, different climatic variables including cyclones, coastal flooding, drought, rainfall, salinity changes, rising sea level, and shifting sea surface temperature have profound antagonistic effects on shrimp and prawn production. These changes might have detrimental impacts on export earnings and overall economy of Bangladesh. Nevertheless, fishery resources are very sensitive to the sea shore, river flows and elevation of the lake, and variations related to ocean, coastal and wildlife productivity. Adoption of climate change with such high exposure to climate risks is becoming an important concern for fisheries organizations. Although fisheries have always had to cope with variable production and unpredictable changes in weather, future climate change will bring shifts in climatic means and in the frequency and severity of extreme events that are beyond the coping capacity of even the more flexible, adapted fishery systems. Considering vulnerability in fishery production systems to the effects of climate change on coastal aquaculture, it is still worth-investing in building the capacity of fishery production systems to adapt future climate change scenarios. The main reason is that the most options for building adaptive capacity are also required to manage fish stocks effectively and to reduce the poverty and vulnerability of fishing-dependent people. However, the adaptation of coastal aquaculture and fisheries to the climate change necessitates a combination of policies and strategies. A holistic approach may help in reducing the adverse effects of climate change on coastal aquaculture and fisheries in Bangladesh to a greater extent.

**Keywords:** Climate change, adaptation, fisheries, aquaculture, coastal area, Bangladesh

## **An overview of integrated urban waste management in Bangladesh and potential source of renewable energy for future sustainability**

**Sk. Shahriar Bin Rasul, Md. Wasikur Rahman\***

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Jashore– 7408, Bangladesh

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### **Abstract:**

The present work is an attempt to review the integrated urban waste management approach in Bangladesh and to introduce solid waste as a potential source of renewable energy for future sustainability. As one of the most populous countries in the world, Bangladesh has an awful setback on the management of solid waste generating in most of the urban cities due to lack of available technologies to rectify the successive piled wastes from the landfill sites. Even though in most cases the piled wastes are burned openly to reduce the volume that causes not only emission of greenhouse gases but also releases carcinogenic chemicals into the air results in posing a serious threat to the environment. In recent years, some municipalities manage the fecal sludge from households through integrated waste management and product-driven approach where co-compost is producing from treated dry fecal sludge and the organic decomposable wastes. The sustainability of this paradigm depends on the various operational and post-operational activities. Waste to energy approach is being introduced in some municipalities through government and non-government organizations on a pilot basis. The biogas production from decomposable waste using anaerobic digestion process is being found promising nowadays. The present study explains the advantages and disadvantages of conventional and other currently practiced waste management systems in the country intending to assess the future stream of advanced technological implications. Moreover, the review presents the possibility of the pyrolytic process preferably the nano-catalytic system as a potential integrated waste management approach considering urban solid wastes and treated dry fecal sludge would be used as feedstock to make them risk-free, reusable and being available renewable energy.

**Keywords:** urban waste, waste to energy, renewable energy, pyrolysis, sustainability.

## **A Study on Mechanical Properties of Carbon Fiber Reinforced Polymer Composite**

**Nasif Chowdhury<sup>1\*</sup>, GM Faysal<sup>2</sup>, and Tarikul Islam<sup>3</sup>, Habibur Rahman<sup>4</sup>, Farjana Yeasmin<sup>5</sup>**

<sup>1,2</sup>Department of Textile Engineering, Anwer Khan Modern University, Dhaka-1230, Bangladesh

<sup>3,4</sup>Department of Textile Engineering, Jashore University of Science and Technology, Jashore-7408, Bangladesh

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\*Corresponding author: nafistextile@gmail.com

### **Abstract**

*The aim of the study is to investigate the tensile and flexural properties of carbon fiber reinforced polymer (CFRP) including graphene and styrene butadiene styrene (SBS). Experimental methods have been used in the study where several laboratory test done on the carbon fiber reinforced polymer (CFRP) graphene and styrene butadiene styrene (SBS). It was determined that styrene butadiene styrene (SBS) acts more correctly in increasing the stiffness of the CFRP's, whereas graphene is more powerful in achieving higher strength. Styrene butadiene styrene (SBS) added samples exhibited highest flexural and storage modulus among all types. graphene delivered samples showed maximum improvement in tensile and flexural power and exhibited maximum strong tensile properties with highest power dissipation capability in tensile test. By contrast, addition of styrene butadiene styrene (SBS) reduced the stiffness and appreciably extended the stress to failure of the composites. Optical microscopy and electron microscopy examinations indicated that addition of styrene butadiene styrene (SBS) and graphene substantially reduced de-lamination and matrix cracking of the CFRP's due to strong interfacial bonding and toughened matrix, respectively.*

**Keywords:** carbon fiber reinforced polymer, tensile properties, flexural properties, graphene, styrene butadiene styrene (SBS)

## **Assessment of Vulnerability to Fire Hazard of RDA market in Rajshahi City**

**Md. Abu Sadath<sup>1</sup>, Farhana Afroz<sup>1</sup>, and Fahim Shahriar Sakib<sup>2</sup>**

<sup>1</sup>Department of Urban & Regional Planning, Rajshahi University of Engineering & Technology, Rajshahi-6204, Bangladesh

<sup>2</sup>Department of Chemical Engineering, Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh

\*Corresponding author: [abusadath98@gmail.com](mailto:abusadath98@gmail.com)

### **Abstract.**

A fire hazard has been a very frequent occurrence in an urban area, nowadays. When urban areas are built without following any guidelines it becomes unmanageable. In Rajshahi city, the RDA market is established, in violation of BNBC (Bangladesh National Building Code) rules and regulations and without proper fire safety measures. Recently, a massive fire was caught at the factory of Kemiko Pharmaceuticals Limited in Rajshahi city. The study attempted to analyze the vulnerability level in the RDA market. Also, 40 individual shops are surveyed to check individual assessments. Analysis based on this indicator was performed and indicators were selected for analysis. To calculate the vulnerability, the indicators were weighted (depending on importance) and graded (based on condition). The findings show that the market building is highly vulnerable with practically no fire safety measures. To reduce vulnerability, there needs to be some proper fire safety planning, market design and modification with the assistance of expert personnel, following appropriate rules and policies.



## **ACCUMULATION AND MOBILIZATION OF HEAVY METALS IN FISHES GROWN IN INDUSTRIAL CONTAMINATED WATER OF SAVAR, DHAKA**

**Md. Abdul Goni<sup>1\*</sup>, Md. Abdullah-Al-Mamun<sup>1</sup>, Md. Abu Shamim Khan<sup>2</sup>, Mizanur Rahman<sup>2</sup> and Lokman Hosen<sup>1</sup>**

<sup>1</sup>Department of Chemistry, Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh; <sup>2</sup>Environmental Laboratory, Asia Arsenic Network, Jashore-7408, Bangladesh

Email: abdulgoni@chem.buet.ac.bd

### **Abstract.**

Rapid industrialization, urbanization, and use of pesticides have caused severe contamination of surface water by heavy and toxic metals, and their rates of mobilization and transportation into the surrounding environment have greatly accelerated in Bangladesh in recent years. The present study analyzes the mobilization of heavy metal and toxic metals from waste water and sediment to fishes. The study also determines the risk assessment of people due to the consumption of fishes grown in industrially contaminated water at Savar area, Dhaka. Four different heavy and toxic metals (Ni, Pb, Cu and Cr) have been investigated in various species of fishes collected from Bangshi River and polluted water around DEPZ area of Savar, Dhaka. The sediment, waste water, and dorsal muscle samples were digested with the acid mixtures following standard procedures and then analyzed by Flame-AAS method. Among the four metals studied, Ni and Pb concentrations were found to be very much higher than the permissible values set by WHO (1985), FAO (2003), and US EPA (2000). Long term consumption of these contaminated fishes could cause serious impacts on human health. The order of metal content was observed to be Ni>Pb in fishes and Pb>Ni in water where Cu and Cr were found to be below the detection limits. Metal concentrations in sediments is found to be in the order of Ni> Cu >Pb> Cr. This research work reveals that the lake water and river water around DEPZ area of Savar, Dhaka are getting highly polluted day by day due to continuous discharging of untreated industrial wastewater. Thus various species of fishes grown into the aquatic system in and around industrial areas are not safe for human consumption.

**Keywords:** heavy metal, bioconcentration factor, fish, health risk.

## **Characterization of dried fecal sludge from urban waste to investigate its energy valorization**

**Sk. Shahriar Bin Rasul, Md. Wasikur Rahman\***

Jashore University of Science and Technology, Department of Chemical Engineering,  
Jashore– 7408, Bangladesh

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### **ABSTRACT:**

With the increasing population and urbanization, the sanitation coverage is additionally increasing but the management of fecal sludge from the septic tank or pit latrines is crucial considerably with time within the developing countries along with Bangladesh. Despite the challenges in managing urban waste by the municipality, resource recovery from waste is currently considered one among the potential solutions. This work is an attempt to characterize dried fecal sludge, obtained from an urban fecal sludge treatment plant to research the prospects of its valorizing into clean energy. The feedstock was collected from an unplanted dry bed based fecal sludge treatment unit under an urban settlement. The proximate and ultimate analysis of the feedstock showed the desirable proportions of the parameters. Thermal degradation of the feedstock was characterized by Thermo Gravimetric Analysis (TGA), heated up to 800°C at five different heating rates 5, 10, 20, 30 and 40°C/min. The FTIR spectral signatures of dried sludge at different temperature conditions were showed a considerable portion of biofuel sources. It is concluded from this research work that the dried fecal sludge from a fecal sludge treatment plant might be a source of valorizing clean energy through the carbonization or trans-esterification process.

### **Keywords:**

Urban waste, Fecal sludge, Valorization, Clean energy

## Composition of aromatic biomarkers in Gondwana shales, Bangladesh

Tanzila Hasan Moyuri, H. M. Zakir Hossain, Md. Mahfuj Hossen

Department of Petroleum and Mining Engineering, Jashore University of Science and Technology, Jashore 7408, Bangladesh

### Abstract

This paper represents composition of polycyclic aromatic hydrocarbons (PAHs) in Gondwana shales from drill hole GDH-40, Barapukuria Basin, Bangladesh in order to examine source rock type and maturity of organic matter. The methodology used here is gas chromatography-mass spectrometry (GC-MS) to find out tri-aromatic hydrocarbons such as phenanthrene (P), anthracene (A), methylphenanthrene (MP), dimethylphenanthrene (DMP), ethylphenanthrene (EP) and methylanthracene (MA). The distribution of 1,7-DMP isomer, gymnosperm-derived pimanthrene, A and MA tend to be high in the investigated shales. The 9-MP and 2-MP ratios in the shales are much higher than coals in this Basin due to an activated methylation in the early stage of oil generation window. Marked negative correlation exists between 9-MP and 2-MP ( $2\text{-MP} = -0.354 \times 9\text{-MP} + 36.6$ ,  $r = -0.53$ ) which implies that input of terrestrial derived organic matter (e.g., coniferous gymnosperm and pteridophytic plants) to the mires. The abundance of the 1,7-DMP tend to be greater in middle part of the Gondwana succession, and relatively lower in the overlying and underlying shale samples inferring varied organic matter input. The 1,7-DMP/1,3- +2,10- +3,9- +3,10-DMP values range between 0.19 to 1.09 suggested a variable organic matter sources or/ or floral changes (e.g., pteridosperms or glossopteris pteridosperms) in and around the peat bogs. The values of methylphenanthrene ratio (MPR) and methylphenanthrene index (MPI 3) in the shales are close to 0.1, indicate unchanging maturation level throughout the Gondwana stratigraphy.

International Conference on Materials, Energy, Environment and Engineering

Paper ID: ICMEEE-PI-526

**Cloud desktop based ICT cell: An application of Virtual Desktop Infrastructure (Cloud computing)**

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<sup>3</sup> Assistant Professor, Dept. of Computer Science & Engineering, Sylhet Engineering College, Sylhet, Bangladesh, [shamsul.cse@sec.ac.bd](mailto:shamsul.cse@sec.ac.bd)

**Abstract.**

At present, the development of global cloud computing is booming. So many governments and large enterprises have their different development strategies and directions for the cloud computing development. To upgrade the present ICT cell in public as well as private sectors Virtual Desktop Infrastructure based cloud desktop may be one of the best approach. For almost all the office environments such as government departments, enterprises, and public service agencies, their current information-based devices can be replaced by using cloud desktops (Virtual Desktop Infrastructure). This process will help to reduce ICT cost, secure data, centralize the ICT management etc. This paper proposed a old enogh but customized idea to rearrange ICT infrastructure by establishing an experimental network. This experimental setup has been tested to proof it as secure, costlier, energy saving and efficient.

**Keywords:** Virtual Desktop Infrastructure, Mobilization of IT, Cloud Computing;

## **Dry anaerobic digestion process for bio-methane production**

**Abu Yousuf<sup>1</sup>\*, Md. Shahadat Hossain<sup>1</sup>, Md. Anisur Rahman<sup>1</sup>, Mamal Uddin<sup>1</sup>, Tahmid ul Karim<sup>1</sup>, and Mahade Hassan Onik<sup>1</sup>**

<sup>1</sup>Department of Chemical Engineering and Polymer Science, Shahjalal University of Science and Technology, Sylhet, Bangladesh

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### **ABSTRACT**

Energy scarcity is soaring due to rapid depletion of fossil fuel reserve in Bangladesh. On the contrary, potential energy source – organic municipal solid waste – is creating serious environmental hazard for municipalities ascribe to ineffective and commercially unviable waste management strategy. Therefore, the present study proposed technically sound dry anaerobic digestion process for biomethane production from organic municipal solid waste. The performance of the dry anaerobic digestion of organic solid waste was evaluated for 35 days operation in batch digesters with 3L effective volume. The effects of different temperature (25, 30, 35, 37 and 40°C) and inoculum flow pattern (multilayer spraying, single layer-spraying, spiral spraying) were investigated to maximize the biogas yield. The result showed that the multilayer inoculum flow pattern produced highest biogas at 37°C. This result justifies that the organic municipal solid waste can efficiently be digested in dry anaerobic digestion process for biofuel production which will also lessen the burden of solid waste management across the country.

**Key words:** Municipal solid waste, Biomethane, Dry anaerobic digestion, Biogas, Inoculum flow pattern.

## **DESIGN AND ANALYSIS OF STRUCTURAL AND THERMAL PROPERTIES OF DIFFERENT DISC BRAKE ROTORS**

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Technology, Chattogram-4349, Bangladesh

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### **Abstract**

The vehicle braking system is considered to be one of the most important safety-critical systems in modern vehicles as its main purpose is to stop or decelerate the vehicle. The use of a specified braking torque on the rotor resulted in heat flux generation. The brake system may fail mechanically if the heat and stress produced are not properly dissipated. This paper represents a new solid disc brake rotor design with curved vents, holes and slots on the surface and analyzes the stress and temperature distribution in the rotor while performing the braking phenomena. SolidWorks is used to construct a 3D disc design and analysis is performed in the ANSYS workbench. Steady state thermal condition and static structure condition has been used to determine the temperature coefficient acting on the disc and to validate ductility and strength, correspondingly. The findings were measured based on the heat dissipation and the compressive stress that was generated during the brake. It can be seen from the simulation of the structural and thermal distribution that the currently available solid disc brake is outperformed by the proposed new disc structure. This result therefore provides a better understanding of the thermal and structural characteristics of the disc brake rotor and allows the automotive industry to create an optimal and efficient disc brake rotor for the motorcycle.

**Keywords:** Disc brake, Static analysis, Thermal analysis, Heat flux, Convection, Shape optimization.

## **Damage Evaluation Due to Effects of Creep of a Thick Cylinder Model Made of Modified Grade 91 Steel**

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### **Abstract.**

This study deals with the evaluation of creep-damage through a finite element analysis (FEA) for a thick cylinder structure made of Mod. 9Cr-1Mo steel. Such a structure is one of the components of Japan Sodium Fast Reactor (JSFR) that suffers the most severe thermal and pressure loadings in the reactor. A test model of this component was developed by Japan Atomic Energy Agency and test was subjected to 1873 cycles of severe thermal transient loading in which elevated temperature at 600 °C and 250 °C was flowed due to sodium flow repeatedly and kept at the final temperature for 2 h and 1 h, respectively. In this research, Thermal Transient Analysis and Plastic Stress Analysis were performed using temperature dependent thermal properties from the test data of aforementioned agency for JSFR. The boundary conditions were adjusted to simulate the temperature distribution on the inner and outer surfaces of the FEA model in the heat transient analysis and the results were used for the plastic stress analysis. Based on the output of plastic stress analysis, damage was evaluated due to creep effects following code-based method of JSME.

## **Effects of Microwave Irradiation on adsorption capacity of Burmese grape (BACCAUREA RAMIFLORA) seeds in the removal of methylene blue from waste water**

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### **Abstract.**

Due to the increase in the number of industries, the amount of waste disposal has been escalating. The major problem arising from the wastes is the contamination of water. So, the treatment of waste-water has become an indispensable concern of the researchers. Bio-adsorbents serve as a feasible solution for decontaminating waste-water by removing organic dyes. Burmese grape seed is a noble bio-adsorbent for this purpose. The specific study concentrates on evaluating the effects of microwave irradiation on the adsorption capacity of Burmese grape (BG) seeds in the removal of methylene blue (MB) from aqueous solution. Three samples of BG were prepared by treating ground powder BG seeds at different microwave irradiation power (450 W, 600W, 750W) for four minutes and these samples were indicated as BG-450W, BG-600W, and BG-750W. Simultaneous batch adsorption experiments were performed at optimum pH and UV-visible spectrometer was used to measure the change in concentration. It was examined that the BG-750W has a higher absorption capacity of 196.37 mg/g at equilibrium with compared to BG-600W and BG-450W with the value of 145.03 mg/g and 116.82mg/g . The effect of the microwave heating period was determined by treating the BG samples at 750 W for 4, 8, 12 and 16 minutes and stipulated as BG-4min, BG-8min, BG-12min, and BG-16min. It was discerned that BG-16min has the highest adsorption capacity of 356.38 mg/g and removal percentage of 77 percent at equilibrium whereas BG-12min, BG-8min, BG-4min has the adsorption capacity of 261.5863 mg/g, 232.6396 mg/g, and 196.0754 mg/g. For all the samples, the adsorption rate was rapid for the first 10 minutes of contact time and at 60 minutes the equilibrium condition was achieved and no further change was observed in concentrations with contact time. The removal mechanism was described by the Langmuir isotherm model. The study shows that maximum sorption of methylene blue was found to be at 16 minutes of irradiation with 750 W of power. So, optimization of the microwave irradiation results in an enhancement of the adsorption capacity of BG seeds from 196.0754 mg/g to 356.38 mg/g.

**Keywords:** Burmese-grape, Microwave irradiation, Adsorption.



**Effect of Acrylonitrile Treatment on Properties of Kenaf Fiber Reinforced Polypropylene Biocomposites**

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**Abstract**

Chemically treated kenaf reinforced polypropylene composites were fabricated using a single extruder and an injection molding machine. Raw kenaf was chemically treated with acrylonitrile for increasing its hydrophobicity and compatibility with polypropylene. Acrylonitrile reacted with kenaf fiber which was confirmed through FTIR spectroscopy. Both raw and treated kenaf at four levels of loading were used during composite fabrication. Mechanical properties of the treated kenaf reinforced polypropylene composites were higher than the corresponding values of the untreated composites. Water absorption of the composites increased with an increase in fiber content. However treated kenaf/polypropylene composites had lower water uptake capacity than those prepared from raw kenaf. This indicates chemical treatment decreased the number of hydroxyl groups in the cellulose of the kenaf fiber. Scanning electron microscopic observation showed that raw kenaf/PP composites possess microvoids, fiber agglomerates and surface roughness with extruded fiber moieties. Due to satisfactory interaction between the treated kenaf and polypropylene, agglomerates and micro-voids in the composites was largely minimized showing better dispersion of the fiber in the matrix. Hydrophilic nature of kenaf was significantly minimized upon surface modification that resulted in better fiber-matrix interfacial adhesion and improved mechanical properties of the composites.

**Keywords:** Acrylonitrile; Kenaf; Mechanical Properties; SEM; FTIR

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## **Effect of edible coating on physicochemical properties and nutritional compounds retention of air dried green banana**

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**Abstract** - The aim of the study was to make an effort to preserve the green banana by using an edible coating of starch, chitosan and mixture of starch and chitosan and studying the quality parameters during storing and air-dried green banana slices. The coating of starch, chitosan and mixture of starch and chitosan with same concentration (1%) were applied to evaluate its effects on retention of nutritional compounds in air-dried banana at various drying temperature 50°C, 60°C & 70° C. The results demonstrated that, mixture of starch and chitosan coating retained a significant amount of bioactive compounds and lower drying temperature showed the lower percentage losses in all cases of coating. Ascorbic acid retention of 70.93% was found in mixture of starch and chitosan coating at 50°C drying temperature. In this similar condition, higher total phenolic content ( $10.52 \pm 0.34^a$  mg GAE/100g) and DPPH scavenging activity ( $45.48 \pm 1.13^a$ ) was obtained which indicated the success of mixtures of coating over single coating.

### **References –**

Postharvest loss assessment of major fruits grown in hill regions of Bangladesh. *Bangladesh Journal of Agricultural Research*, 42(1), 171-184. Hossain, M., Khatun, M., Matin, M., & Dewan, M. (2017).

## **Experimental Study on the Effect of Iron-Based Nanoparticles on Fluid Loss in Drilling Operation**

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Drilling fluid loss also known as mud loss is considered as one of the critical issues during the drilling operation as it can cause severe formation damage. To minimize fluid loss, researchers introduced numerous additives but did not get the expected result. Recently, the use of nanoparticles (NPs) in drilling fluid gives a new hope to control the fluid loss. Previously researchers investigated the impact of NPs on fluid loss by mixing it with simple bentonite water-based mud (WBM). However, in a real situation bentonite WBM hardly use in reservoir zone. A KCl-Glycol-PHPA polymer-based fluid that is used in practical drilling operation is chosen for the present study. In-house prepared hematite ( $\text{Fe}_2\text{O}_3$ ) with nano-size is used in KCl-Glycol-PHPA polymer-based fluid to investigate the effect of NPs on fluid loss in the formation. In addition, the rheological improvements are examined by changing the NPs concentrations.

Hematite ( $\text{Fe}_2\text{O}_3$ ) NPs are synthesized from the co-precipitation method using ferric chloride hexahydrate ( $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ ) as precursor and ammonium hydroxide ( $\text{NH}_4\text{OH}$ ) as a precipitating agent. Hematite NPs have an average size of 27.92 nm and characterized using X-ray powder diffraction (XRD). A basic KCl-Glycol-PHPA polymer-based mud is made, and six different concentrations of 0.1, 0.5, 1.0, 1.5, 2.0, 3.0 wt% NPs are prepared by mixing NPs with the basic mud. API Low-pressure low temperature (LPLT) filter press test is performed to calculate the filter loss volume, and the various rheology such as viscosity, yield point, gel strength etc. are determined.

The experimental observations reveal that fluid loss of basic mud is 5.9 ml after 30 minutes, and prepared nano-based drilling mud result in a less fluid loss at all concentrations. Nanoparticles with concentration of 0.5 wt % results in a 5.1 ml fluid loss at the API LTLP filter press test. On the other hand, nanoparticles with concentration of 3.0 wt% enhance the plastic viscosity, yield point and 10s gel strength by 15.0%, 3.0% and 12.5%, respectively.

The optimum concentration of hematite NPs is found to be 0.5 wt% which results in a reduction of API LPLT fluid loss by 13.6% and an improvement of plastic viscosity by 10%. The yield point is also found to be increased with the increase of NPs concentration, which reflects a better cutting transport capacity of drilling mud. It can be concluded that hematite an iron-based nanoparticles can be used with the basic mud as an additive to reduce the fluid loss and improve the rheological properties.

## Effect of Cast in Delay and Evaporation on Compressive Strength of Concrete

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### Abstract.

Compressive strength of concrete can play an important role on the sustainability and stability of concrete structure. Several factors can influence the quality of concrete including compressive strength. Due to some unexpected circumstances, complete concrete casting may not be possible at times. Hence, the objectives of this study are to investigate the effect of cast in delay and evaporation on compressive strength of concrete. In this purpose, compressive strength of concrete was determined for four different types of casting delay allowing evaporation or not. The results reveal that casting delay augments the compressive strength and there are no effects of evaporation.

## **Environmental Factors of Climate Change in Bangladesh Over the Years**

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### **Abstract**

Bangladesh is in danger of losing some of its regular seasons because of ever-increasing global warming and other environmental factors. Some unusual patterns have been being noticed for last couple of years in case of seasonal cycle. The winter is getting shorter and shorter whereas the summer is lengthening more and more. The objective of this study is to assess the variation patterns of climate in the country over the years along with some related environmental factors like urbanization, deforestation, and carbon di oxide (CO<sub>2</sub>) emissions based on historical data available. Data on average monthly temperature, rainfall, forest area coverage have been collected from World Bank's website. Deforestation data have been collected from mongabay.com whereas urbanization data have been collected from banglapedia.org. Data on CO<sub>2</sub> emissions have been assembled from World Bank's website and ychart.com. Temperature and rainfall have been found to have strongly positive ( $r = 0.80$ ) and highly significant relationship, while forest area percentage and CO<sub>2</sub> emissions have been found to have strongly negative ( $r = -0.95$ ) and highly significant relationship. The results of the study have significance in policy making since variations in climate pattern have its consequences on the overall economy and livelihood of people of the country.

**Keywords:** Pearson's correlation coefficient, rainfall, temperature, deforestation, climate change.

## Effect of pre-treatments on osmotic-air drying of guava

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### Abstract.

Guava (*Psidium guajava* L.), being a tropical fruit grows plenty in subtropical countries also and has numerous health and nutritional benefits. Due to improper storage and preservation techniques, guava producers especially from Barishal division face a great financial loss almost every year in Bangladesh. This study was undertaken to prepare dried guava by combining osmotic and air drying process. Freshly harvested guavas were cut into 2 mm slices and treated by blanching in hot water (80°C, 3 min) and dipping in vinegar-water solution (1:3 w/w, 30 min). Thereafter, the slices were dried osmotically (4 hr) in 30% sugar, and 29% sugar +1% salt solution and finally air drying (70°C, 5 hr) was conducted. From osmotic-air drying, the maximum water loss (40.12%), solid gain (8.09%) and drying rate constant (0.976/hr) was obtained for blanched guava slices that was osmotically dried in 30% sugar solution. But, vinegar pre-treated guava slices, dipped in 29% sugar +1% salt solution was the best in terms of taste preference. Overall, this study concludes that osmotic-air drying with vinegar pre-treatment can be a simple but an effective method of guava preservation with better taste.

**Keywords:** Guava slices, Hot water blanching, Vinegar, Osmotic drying, Air drying

## **Effect of Human Hair and Copper Wire Hybridization on the Properties of Polypropylene Composites**

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### **Abstract.**

Hybrid composites are usually used when a combination of properties of different types of fibers have to be achieved. These composites have unique features that can be used to meet various design requirements in a more economical way as compared to conventional composites. The main purpose of present research is to combine different properties of natural and synthetic fibers in a single hybrid composite. Human hair and copper wire fiber reinforced hybrid polypropylene composites were prepared using a hot press machine. Human hair and copper wire fiber loading was varied at 5, 10 and 15 wt% keeping human hair and copper wire ratio at 1:1 during composite preparation. Tensile, flexural, hardness, impact and water absorption tests of the prepared composites were subsequently conducted. Thermal stability of the composites was also evaluated using thermogravimetric analysis. Young's modulus, flexural strength, flexural modulus, hardness, impact strength and water absorption increased with increase in fiber loading. On the other hand tensile strength had the opposite trend. According to thermogravimetric analysis, 15% human hair and copper wire reinforced hybrid composite had higher thermal stability as compared to other two composites. Thus 15 wt% human hair and copper wire fiber reinforced hybrid polypropylene composite had the best set of mechanical and thermal properties among all prepared composites.

**Keywords:** Human Hair; Copper Wire; Polypropylene; Hybrid Composite; Mechanical Properties; TGA

## Effects of Various Osmotic and Chemical Pretreatment Methods on Drying Kinetics and Physicochemical Properties of Tomatoes (*Solanum lycopersicum*)

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Tomato is one of the most widely consumed fresh vegetable in Bangladesh. Since it has limited shelf life and highly perishable at ambient conditions thus drying technique can be applied to preserve tomatoes. Substantially, Pre-treatments with chemicals before drying have been used in order to minimize adverse changes during drying and subsequent storage tomatoes. The present study was to evaluate the drying kinetics convective hot air-dried tomato slices and to identify changes of different physicochemical parameters during drying. Drying of tomatoes with and without chemical pretreatments (0.2% KMS, 0.2% KMS+1% CaCl<sub>2</sub>) and osmotic pretreatments (65°Bx, 1% CaCl<sub>2</sub>, 1% CaCl<sub>2</sub> + 55% Sucrose) in terms of drying kinetics evaluated at 68°C, having the experimental data been tailored to unlike empirical kinetic models. Contrariwise, influence of the pretreatments on drying of tomatoes on different physicochemical contents was observed. Sensory evaluation of tomato powder was carried out, there was no significant difference to flavor, texture as well as overall acceptability among the samples but significant difference was observed in terms of color among the samples. Potassium Metabisulphite (KMS) along with CaCl<sub>2</sub> showed the better color than other samples. 0.2% KMS + 1% CaCl<sub>2</sub> exposed higher percent regaining of tomato powder (4.65%) than sucrose laterally with CaCl<sub>2</sub> (4.36%) and control (4.09%). However, KMS treated sample showed lowest percent recovery (3.83%). It was obtained that the page model is best for describing the dehydration kinetics of Tomatoes. During the drying process, it was detected that the pretreated samples has lower drying time than the untreated one. Among all the processes, 0.2% KMS + 1% CaCl<sub>2</sub> was the best pretreatment which gives the highest value of Ascorbic acid (27.82±1.05 mg/100g) and Antioxidant activity (48.89±1.33%) which is the closet to the fresh sample.

Keywords: Potassium Metabisulphite (KMS), Osmotic Pretreatments, Chemical Pretreatments, Physico-chemical Properties



### **Evaluating mineral medium composition in performance of denitrification**

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#### **Abstract**

This study deals with denitrification; nitrate was converted to nitrogen gas in a single chamber mixed culture bioreactor. Single chamber mixed culture bioreactor is an innovative technique for biological nitrogen removal from wastewater during which nitrate and nitrite were reduced to nitrogen gas by denitrifying heterotrophic bacteria. The process needed minerals upto a certain concentration for the effective operation. Furthermore, organic substrate played a major role in denitrification. The relation among denitrifying activities with minerals, oxygen and carbon source were the subject of this research. The mixed organism can use both nitrite and nitrate as an electron acceptor. The affinity of the organism to nitrate was much higher than the nitrite. Same organism was responsible for both nitrate to nitrite and nitrite to nitrogen conversion. The microbial community analysis shows that the major denitrifying genus was *Pseudomonas* and *Halomonas* (60-70%). High magnesium concentration was increased the possibility of nitrite accumulation during the denitrification process. Low sodium acetate concentration was favorable for the mixed culture denitrification; but it was important the presence of a minimum acetate concentration in the bioreactor for better microbial activities. Phosphate concentration did not show significant effect on denitrification but in fed-batch process nitrite accumulation was observed for low phosphate concentration. At low phosphate concentration *Pseudomonas* was 45% higher than *Halomonas* but at high phosphate concentration *Halomonas* was higher by 40%. It indicated that *Halomonas* has high affinity to nitrite compare to nitrate. High iron concentration inhabits the denitrification and reduced the denitrification rate. High minerals may give the advantages to both denitrifying phosphates accumulating organism and glycogen accumulating organism to grow through the consumption of acetate. As a result a low specific nitrate removal over acetate but high nitrate removal rate and high sludge concentration at high minerals condition.

## **Fire Risk Assessment of Residential High-Rise Building in Khulna City**

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**Abstract:** Recently a few years fire accident becomes a threat in urban area. The unplanned urban structures without proper fire safety guidelines are responsible for the accident with economic loss and high mortality. In Khulna city, there is a large number of residential building which are constructed violating the rules and regulation of Bangladesh National Building Code (BNBC) and Bangladesh Fire Service and Civil Defence (BFSCD). These buildings have no fire safety measures. 20 buildings are surveyed through key interview, discussion and reviewing design structure. Finding show that among the 20 surveyed building, most of them are highly vulnerable condition and are in high risk fire hazard. Some buildings are too much old and that didn't follow the BNBC & BFSCD code for fire safety. The newly developed buildings maintain the proper rules for construction but don't have fire safety measures. The residential buildings are highly developed but most of this building don't have any evacuation route or fire extinguisher at the time of emergency. Fire safety planning, designing and modification of the building with the help of expert personnel by following the proper rules and policies are needed to reduce the fire risk.

**Keywords:** Fire accident, BNBC, BFSCD, evacuation, fire safety

**Fabrication of pH sensor based on polyaniline modified nickel foam**

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**Abstract:**

Polyaniline (PANI) a conducting polymer with amine group can be protonated or de-protonated in controlled manner. It is observed that on de-protonation in PANI leads in decrease of charge carriers along the polymer chains, that changes the electrical and redox properties of PANI. Thereby, polyaniline found to be H<sup>+</sup> sensitive. In this work we have electro-polymerized PANI onto pre-modified nickel foam and studied its performance on pH detection based on square wave voltammetry and zero current potential measurement<sup>1</sup>. PANI modified nickel foam shows excellent sensing performance, with sensitivity of 61.4 mV/pH, repeatability of 98.9% and response time of 12.8s. PANI modified nickel foam would open up the door of developing a reliable and flexible sensing platform to detect pH in real samples.

**Keywords:** Electrochemistry, conducting polymer, pH sensor

## **Geographical Data Analysis of CO<sub>2</sub> Emissions Applying GIS in South Asia**

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### **Abstract**

CO<sub>2</sub> is one of the most influential greenhouse gases. Contemporary carbon dioxide intake is playing a significant role in increasing global warming. CO<sub>2</sub> emissions (Metric tons Per capita) studied in South Asian countries (India, Pakistan, Bangladesh, Sri Lanka, Afghanistan, Nepal, Maldives, and Bhutan) are increasing day by day. Recent case studies in South Asia, emissions of geo-information technology, monitoring of sources of CO<sub>2</sub>, transport of CO<sub>2</sub>, storage of CO<sub>2</sub> are playing a special role. This paper presents a survey on modeling methods, techniques, and tools from various sources of CO<sub>2</sub> emissions formed in South Asian countries, GIS database development and a geographical amount of how CO<sub>2</sub> emissions (Metric tons Per capita) have changed according to data in 2017.

**Keywords:** CO<sub>2</sub> Emissions, South Asia, CO<sub>2</sub> Storage, Data analysis, Geographic Information System (GIS).

## **Glass and Nylon Fiber Enhanced Hybrid Polypropylene Composites**

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### **Abstract**

Hybrid composites containing more than one type of fiber in a single matrix are recently gaining extensive interest worldwide. These composites have specific advantages over conventional composites that include balanced strength, stiffness and bending properties, balanced thermal distortion stability, reduced weight and/or cost, improved fatigue resistance, reduced notch sensitivity, improved fracture toughness and/or crack arresting properties and improved impact resistance. In present research, hybrid composites were prepared using hot press technique by incorporating glass and nylon fiber in polypropylene matrix. Fiber loading was varied at 5, 10 and 15 wt% keeping glass and nylon fiber ratio at 1:1 during composite preparation. Tensile, flexural, hardness and water absorption tests of the prepared composites were subsequently conducted. Thermal property of the composites was also evaluated using thermogravimetric analysis. All mechanical properties (except tensile strength) and water absorption increased with increase in fiber loading. Thermogravimetric analysis revealed that 15% glass and nylon fiber reinforced hybrid polypropylene composite had better thermal stability as compared to other two composites. Thus 15 wt% glass and nylon fiber reinforced hybrid composite had the best set of mechanical and thermal properties among all prepared composites. These prepared composites can be used in manufacturing mirror casting, paper weights, doors, windows and so on.

**Keywords:** Glass; Nylon; Polypropylene; Hybrid Composite; Mechanical Properties; TGA

**Improved structural and electrical properties of Mg-doped BaTiO<sub>3</sub> ceramics for energy storage applications**

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**Abstract.**

In this study, BaTiO<sub>3</sub>, BaMg<sub>0.005</sub>Ti<sub>0.995</sub>O<sub>3</sub>, BaMg<sub>0.015</sub>Ti<sub>0.985</sub>O<sub>3</sub>, and BaMg<sub>0.025</sub>Ti<sub>0.975</sub>O<sub>3</sub> ceramics were prepared by solid-state sintering route. The structural and electrical properties of the samples were analyzed effectively. The XRD analysis ensured the presence of perovskite structure along with the tetragonal phase. No impurity phases were detected. The positive slope value of the W-H plot proved the appearance of tensile strain in the specimens. The maximum average grain size was observed in BMT0.5 (809.20 nm). A grain growth retardation phenomenon was perceived as the Mg content exceeded its solubility limit into BaTiO<sub>3</sub> ceramics. All of the specimens exhibited higher dielectric constant at 200 Hz because of the excessive reorientation of the dipolar complex ( $Mg''_{Ti} - V_{O}''$ ) while at a higher frequency, the reorientation capability reduced. BMT0.5 ceramics exhibited enhanced dielectric constant value (1712) while the values for BMT1.5 and BMT2.5 were satisfactory. Initially, the loss factor of the specimens was higher, but at a higher frequency, they became uncommitted.

**Keywords:** XRD analysis, lattice strain, SEM analysis, dielectric constant, loss factor.

**Interference of minerals on the UV-spectrophotometric determination of ammonium, nitrite, nitrate and phosphate**

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**Abstract:**

This study described the interference of different minerals that generally used in number of bi-process on UV-spectrophotometric determination of ammonium nitrogen ( $\text{NH}_4^+\text{-N}$ ), nitrite-nitrogen ( $\text{NO}_2^- \text{- N}$ ), nitrate-nitrogen ( $\text{NO}_3^- \text{-N}$ ) and phosphate ( $\text{PO}_4^{3-}$ ). Iron, magnesium and sodium acetate has significant interference in Nesslerization of  $\text{NH}_4^+\text{-N}$ , need to adopt standard protocol for the accurate determination of  $\text{NH}_4^+\text{-N}$ . Increasing amount of reagents; Nessler and other would overcome the limitations of determination caused by the interference of minerals on Nessler method. Magnesium and iron did not affect sulphanilamide method for the determination of  $\text{NO}_2^- \text{- N}$ . The presence of sodium either in form of sodium acetate or sodium chloride has significant effect on  $\text{NO}_2^- \text{- N}$  determination. The complex formed by nitration (react with  $\text{NO}_3^- \text{-N}$ ) of salicylic acid was not interfered by the presence of potassium, phosphate, sodium, magnesium, iron and sodium acetate. Ammonium molybdate method for the determination of  $\text{PO}_4^{3-}$  was a robust method that was not affected by the presence of minerals.

## **Manufacturing & Characterization of Glass Samples with Three Different Sources of Silica: Possible Alternatives for Quartz in Glass Manufacturing.**

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### **Abstract**

Pure silica sources as quartz, quartzite and glassmaker's sand are traditionally used for commercial glass manufacturing. Limitation of sources, degradation of purity with the change in mining and processing techniques, very high fusion temperature and import dependence make them costly and non-feasible in most of the cases. The research is to investigate the possibility of using locally available silica sources and silica rich wastage material which can reduce the cost and enhance environmental safety. Quartz, calcined Rice Husk Ash (RHA) and Padma River sand are used as silica sources to manufacture three types of glass samples respectively, with similar composition. The glasses are characterized for physical properties, chemical stability, thermal shock resistance, softening point, micro hardness, and optical properties. The results of these tests reveal that, the use of both RHA and Padma River sand, especially of river sand, as alternative for quartz reduces the porosity, acidic corrosion, transition range temperature and also increases the thermal shock resistance and fracture toughness of the glass samples with a little fluctuation in colors. These indicate it is highly realistic and cost efficient to use locally available river sand or RHA in glass products which do not require high degree of optical specifications.

**Key Words:** Glass Manufacturing, RHA, Padma River Sand, Micro hardness, Optical Properties.



## **Mechanical Properties of Waste Jute and Cotton Fiber Reinforced Hybrid Polypropylene Composites**

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### **Abstract.**

Now a days, high performance and cost-effective products are in high demand. Make it more environmental friendly is another basic requirement for current environment. In present research, waste cotton and jute fiber reinforced hybrid polypropylene composites were prepared using hot press technique. Fiber loading was varied at 5, 10 and 15 wt%. As both cotton and jute are cellulosic fiber, the prepared composites are biodegradable. On the other hand, both fibers are collected from the manufacturing wastage, thus the prepared composites are also cheap. Tensile, flexural and hardness tests of prepared composites were subsequently conducted. Young's modulus, flexural strength, flexural modulus and hardness increased with fiber loading. On the other hand, tensile strength had the opposite trend. Thus 15 wt% jute and cotton waste fiber reinforced hybrid polypropylene composite had the best set of mechanical properties among all prepared composites.

**Keywords:** Cotton and Jute Waste; Polypropylene; Hybrid Composite; Mechanical Properties.

## **Mechanical Properties of Coir and Nylon Fiber Reinforced Hybrid Polypropylene Composites**

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Engineering and Technology, Dhaka 1000, Bangladesh

### **Abstract**

Use of plant fiber and synthetic fiber as reinforcement in polymeric composites has numerous advantages as plant fiber is biodegradable and synthetic fiber has high modulus. So if coir (natural fiber) and nylon (synthetic fiber) is used as hybrid reinforcement, both biodegradability and high strength can be obtained in a single composite. Besides, nylon and coir both are of low density, low cost, easily available and nontoxic. In present research, coir and nylon fiber reinforced hybrid polypropylene composites were prepared using a hot press machine. Fiber loading was varied at 5, 10 and 15 wt%, while coir and nylon fiber ratio was varied at 1:1, 1:3 and 3:1 during composite preparation. Tensile, flexural, hardness and water absorption tests of the prepared composites were subsequently conducted. Tensile strength, Young's modulus, flexural strength, flexural modulus, hardness and water absorption increased with increase in fiber loading. On the other hand composite containing coir and nylon fiber at a ratio of 1:3 had the highest tensile strength, Young's modulus, flexural strength, flexural modulus and hardness values. Thus 15 wt% coir and nylon (1:3) fiber reinforced hybrid polypropylene composite had the best set of mechanical properties among all prepared composites.

**Keywords:** Coir; Nylon; Polypropylene; Hybrid Composite; Mechanical Properties

**Preparation of Au decorated TiO<sub>2</sub> nanotube arrays as proficient visible light active catalyst for photocatalytic conversion of CO<sub>2</sub> to CH<sub>4</sub>**

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**Abstract.**

In this study, a modified visible light active catalyst was synthesized through the stepwise facile electrochemical anodization and deposition method. Engulfing of Au nanoparticles into TNTs was followed with varieties weight percentages of Au (ATs) with increasing time. The photocatalytic efficiency of synthesized catalysts was evaluated through photocatalytic CO<sub>2</sub> conversion. In order to justify the characteristics of synthesized TNTs, 1-ATs, 3-ATs and 5-ATs, FESEM, EDX, TEM, XRD, XPS, UV-Vis and PL has been attained. The FESEM images showed Au increasing trend on the nanotube surface whereas crystalline nature was confirmed through XRD analysis that further confirmed by TEM analysis. Owing to LSPR nature of Au nanoparticles 3-ATs showed significant visible light absorption in comparison with TNTs. The lower e<sup>-</sup>/h<sup>+</sup> recombination was also confirmed through PL analysis. Hence the obtained CH<sub>4</sub> from the photocatalytic CO<sub>2</sub> conversion for the synthesized catalysts was attained as ~3 ppm, ~13 ppm, ~22 ppm and ~17 ppm for TNTs, 1-ATs, 3-ATs and 5-ATs. This study persuades a promising way to synthesize proficient visible light active catalyst to increase the photoactivity of CO<sub>2</sub> conversion by lowering the e<sup>-</sup>/h<sup>+</sup> recombination rate of TiO<sub>2</sub> nanotube arrays with enhanced visible light efficiency to remediate energy and environmental crisis.

**Keywords:** Au-TiO<sub>2</sub> nanotube arrays, LSPR, Visible light, CO<sub>2</sub> conversion, CH<sub>4</sub>

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## **Phytochemical Screening and Antimicrobial Effects of Different Extracts of *Catharanthus roseus***

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### **Abstract.**

Bangladesh is enriched with numerous medicinal plants that are not yet analyzed in depth. Several studies show that *Catharanthus roseus* is one of the powerful medicinal plants with various essential biochemicals. In this research work, we have focused to investigate the bioactive compounds and antimicrobial activities of different organic extracts of *Catharanthus roseus*. For this purpose, we have considered four different organic solvent extracts such as: ethanol, chloroform, petroleum ether and ethyl acetate are used for qualitative phytochemical analysis of *Catharanthus roseus*. The presence of Alkaloids, Flavonoids, Protein, Phenol, Saponins and other phytochemicals are determined using many chemicals like- Mayers reagent, mercuric chloride, 1% sodium hydroxide, ferric chloride, cons. sulphuric acid, etc. The formation of precipitate or different color indicates the presence of different phytochemicals. Agar well diffusion method is used for antimicrobial testing of different organic extracts against one Gram-positive (*Staphylococcus* sp) and three Gram-negative (*Citrobacter* sp, *Escherichia coli* and *Aeromonas* sp) bacteria. Moreover, this study supports the importance of using medicinal plants as an alternative source for the treatment of various diseases and other pharmaceutical purposes due to minor or absent side effects, cost effectiveness and development of resistance to conventional synthetic antibiotics.

# Physio-Mechanical behavior of different types of local and imported clays as a raw material used in traditional ceramic body preparation

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## Abstract.

In Bangladesh different ceramic industries are importing various clay raw materials for production of several traditional ceramic product like tiles, tableware, sanitary wares, bricks etc. Those clays are imported from different country around the world due to having some superior properties such as high plasticity, low water absorption, high impact strength, and high bending strength and so on and also for their high purity level. Local clays of Bangladesh are not used in those traditional production may be for lack of both physio-mechanical properties and purity. In this research various local clays were collected from different region of Bangladesh and some imported clays were also collected. And then they were named as R-clay (Rajshahi Clay), B-clay (Ball Clay), B2-clay (Bijoypur Clay), C-clay (China Clay) and S-clay (Sherpur Clay). Physical properties like drying weight loss, firing shrinkage, water absorption and mechanical properties such as bending strength, impact strength, and plasticity of those local and imported clays were investigated by doing several tests. Both circular and square shape tiles were made for every tests. Each and every tests showed that local clays were in better properties both in physical and mechanical properties comparable to imported clays. Each tests also showed that R-clay had the best physio-mechanical properties among both imported clays and other local clays.

**Keywords:** Local Clay, Imported Clay, Mechanical Properties, Physical Properties

**Production of environment friendly biodiesel from animal fats**

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**Abstract.**

As fossil fuels are limited sources of energy, this increasing demand for energy has led to a search for alternative sources of energy that would be economically efficient, socially equitable, and environmentally sound. The purpose of this work was to utilize available animal fat for the production of biodiesel through transesterification. Extracted oil from animal fats were transesterified with methanol in presence of KOH catalyst. The condition for transesterification was 5:1 methanol:oil molar ratio, 55-60°C temperature and the reaction time was 10 hour. 89.5 vol.% biodiesel was obtained from extracted oil. The resulting products were confirmed by FTIR and evaluated by ASTM analyses. The obtained biodiesel exhibited moderate density (0.875g/cm<sup>3</sup>), average dynamic viscosity (4.98 Cp at 40°C), average kinematic viscosity (5.70 cSt at 40°C), high flash point (162°C), low cloud point (4°C), low pour point (-1°C), high calorific value (11175.20 BTU/lb). Obtained biodiesel has a higher flash point than fossil diesel and so is safer in the event of crash. Besides, other biodiesel properties such as density, viscosity, cloud point, pour point, calorific value are comparable to the biodiesel produced from commercial vegetable oils.

**Physicochemical and Mechanical Properties of Natural Fiber Reinforced Thermoplastic  
Nano-composites**

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**Abstract.**

Copper nano particles (CuNPs) were synthesized from copper chloride dehydrate precursor in aqueous medium using polyvinyl alcohol, sodium borohydride and ascorbic acid. The ultraviolet-visible spectroscopy, Fourier transformed infrared spectroscopy and transmission electron microscopy were employed to analyze the formations and sizes of nano particles. This copper nano-particle was impregnated into the fibers via cationization of the fibers where the cationic agent was (3-chloro-2-hydroxypropyl) trimethylammonium chloride. A novel kind of nano-composite were developed where the nano-particle loaded strong and durable sawdust based reinforcing agents were fabricated and utilized to make the nano-composite with unsaturated poly ester resin. The characterization of nano composites were done by FTIR spectroscopy, TGA, DSC, SEM, XRD, tensile strength, tensile modulus, water absorption and biodegradability study. The observed properties of the developed nano composites indicate that they can be considered for indoor to outdoor applications.

**Keywords:** Nano-particle, Sawdust, Polyester resin, TEM, XRD

## **Preparation and Characterization of Activated Carbon from Tea Waste by Chemical Activation Method.**

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### **Abstract.**

In this work, an attempt was performed to fabricate, analyze and characterize activated carbon utilizing H<sub>2</sub>SO<sub>4</sub> as an activating agent. Activated Carbon synthesized from tea waste employing chemical activation technique displays exemplary development in the surface properties. Surface morphology in turn strongly influences the absorption characteristics with functional groups. The activated carbons were synthesized at different activation temperature: 450°, 500° and 550 °C respectively with carbonization time of 15 minutes and various impregnation ratio. Percent crystallinity and surface morphology of the prepared sample were investigated through XRD and SEM. SEM picture showed that the grains were agglomerated together and existence of large amount of porosity. The major elements found by EDS analysis was C along with other elements like O, Si, Ca and K. The presence of various surface functional groups: O-H, C=O, C-C-C and C-H were ensured by FTIR spectroscopy. DSC analysis showed the good linear heat flow behavior of the activated carbon.

**Keywords:** Activated carbon, XRD, SEM, Carbonization, Tea waste.



**POLLUTION CHARACTERISTICS AND HEALTH RISK ASSESSMENT OF  
HEAVY METALS IN VEGETABLES GROWN IN CONTAMINATED SOIL AT  
INDUSTRIAL AREAS OF SAVAR, DHAKA**

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**Abstract.**

Vegetables provide essential nutrient elements to human diet. Plants import chemical elements and nutrients directly from soil or water by root absorption, resulting in accumulation in different tissues. The most common route for metals to enter into the food chain and human body in excessive level, is the cultivation of vegetables in industrially contaminated soil. The present study investigates the heavy and toxic metal concentrations in contaminated water, soil, and vegetables grown in and around an industrial contaminated area of Bangladesh. Seven different vegetable samples were studied in this research work. The samples were digested using acid mixtures following a standard procedure and then analyzed by Flame AAS method. Different parts of plant body along with corresponding soil and water samples were also examined for heavy metals contamination. Average concentrations of different metals (Ni, Pb, Cu and Cr) found in the edible parts and corresponding roots and soil were compared with the permissible levels reported by FAO/WHO (1984), and EU-standard. Metal concentrations in most of the food plants parts have observed to be higher than those permissible limits. Bioaccumulation trends of the metals in different vegetables with corresponding health risk, bioconcentration factor (BCF), and relative health risk (HR) have also been determined in this study. The present research findings reveal that long term consumption of vegetables grown in and around DEPZ and bank town industrial areas of Savar, Dhaka could cause a serious health risks to the people of Dhaka city.

**Keywords:** heavy metal, accumulation, bioconcentration factor, health risk.

## **Review on Biofuel Production Process from Biomass**

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### **Abstract**

Biofuels are receiving tremendous attention worldwide as a source of renewable energy. Biomass, which is found abundant in nature, can be converted into different types of biofuels. Different forms of fuel depend on the type of conversion processes such as acid & alkaline pre-treatment, pyrolysis & gasification method, transesterification, fermentation process etc. and produces biodiesel, bio-methane, bioethanol, bio-oil, gasoline etc. Recently, researchers highlighted more sustainable bioenergy production technologies. This review paper focus on processes to convert biomass into biofuel and can guide future research towards commercialization of sustainable biofuels.

**Keywords:** Biomass, Analysis, Pre-treatment, Thermochemical, Biofuel.

**ROADSIDE SOLID WASTE MANAGEMENT SYSTEM: A CASE STUDY ON  
ISLAM NAGAR ROAD AT THE EASTERN SIDE OF KHULNA UNIVERSITY in  
2019**

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**ABSTRACT**

The rate of solid waste generation is increasing day by day due to escalating global population and rapid urbanization. It is predicted that the amount of global solid waste will be 19 billion tons by 2025. This wastes management is essential for the protection of environment as well as environmental elements such as soil, water source, and air etc. But in the developing country like Bangladesh, it is so tough to manage wastes due to limitation of resources like lack of finance, lack of man power, as well as the lack of logistics. The objective of this paper is to assess the existing condition of solid waste management of the Islam Nagar road beside Khulna University and its impact on surrounding environment. Islam Nagar road starts from the Khulna-Satkhira Highway and passes towards north along the eastern boundary of Khulna University.

Data on amount of wastes generated from the roadside student hostels, mess, hotel-restaurants, shops and tea stalls in terms of different category is collected through field survey. Existing waste storage, transportation, disposal etc. practices are analyzed. To evaluate the performance of solid waste management, AHP decision making analysis is done. It is observed that the roadside shops such as tea stalls, restaurant, hotels respectively generate approximately 5kg, 30.87 kg and 52.29 kg per day. But they burn their waste beside road or dump in nearby water bodies. The field survey analysis showed that hotels and restaurant generate higher amount of waste per day as well as they dumped in remotely situated dustbin i.e. hauled container bin or beside Mayur river. In this case a variation is also found in the study area where a certain point is served as those shops are under Gollamari bazar. On the other hand, after that certain portion of the road, another shops, restaurants etc. remain unserved as that portion of area is not under the Gollamari bazar as well as Khulna city corporation. The Analytical Hierarchy Process (AHP) analysis indicates that disposal system and transportation system condition is very poor. That's why, to improve such condition dustbin, local community waste collection van is needed.

**Keywords:** *Roadside solid waste, Environmental impact, AHP, Khulna University.*

## **Sodium Alginate based biodegradable food packaging materials: A Review**

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### **Abstract.**

The present work is an attempt to review sodium alginate based biodegradable food packaging materials. Degradable polymers exist globally, nevertheless, they suffer drawback from biodegradability, high cost, standard tensile and antimicrobial properties. Therefore, there is a need to find alternative packaging polymers from naturally abundant raw materials that are renewable and easily degradable; simultaneously they are low cost, eco-friendly and no health risk. To meet the current demand of polymeric materials with desired properties, sodium alginate based biodegradable polymers through addition of plasticizers, monomers and gamma irradiation can be a probable solution. In fact, alginate is biodegradable, biocompatible, bioactive, less toxic and low cost polysaccharide quite abundant in nature. The development of sodium alginate-based polymeric films would be biodegradable potential material towards practical applications. This bio-composite film might be a possible solution to replace non-biodegradable and expensive biodegradable packaging materials.

**Keywords:** sodium alginate, food packaging, biodegradable materials

## **Synthesis, Characterization and Application of Amberlite XAD-4 Resin Functionalized with N-Salicylidene Anthranilic Acid for Preconcentration and Separation of Zinc in Aqueous Solution**

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**Introduction:** Heavy metal pollution is a major threat for human life in many countries including Bangladesh. The major sources of heavy metal pollutant are household hazardous wastes, industrial effluents and runoff from agricultural fields<sup>1</sup>. Heavy metals are harmful due to its adverse effect in biological system including human. Although zinc is an essential heavy metal but excessive doses of zinc in human causes nausea, anemia, skin irritations, vomiting and stomach cramps<sup>2</sup>. Therefore, it is necessary to determine trace quantity of zinc in environmental samples regularly. But, the direct determination of heavy metal like zinc in real samples is not always possible due to low concentration of zinc as well as matrix interferences. To overcome these difficulties, a suitable preconcentration and separation technique is necessary to apply before determination of zinc accurately. Solid phase extraction (SPE) is an attractive method for the selective separation and preconcentration of zinc in real sample. In this study, a new functionalized resin has been synthesized by coupling Amberlite XAD-4 resin with N-salicylidene anthranilic acid through an azo (-N=N-) spacer for SPE of zinc in aqueous media.

**Method:** The newly synthesized resin was characterized by TGA and FT-IR. The resin was effectively used for the preconcentration and separation of zinc prior to measurement by flame atomic absorption spectrometry (FAAS). To achieve maximum efficiency of functionalized resin, experimental parameters such as pH, shaking time, amount of resin, eluent concentration, eluent volume and initial concentration of zinc have been investigated and optimized using batch method.

**Results:** The optimum pH and shaking time for preconcentration of zinc were found to be 6 - 7 and 120 min. respectively. Under selective pH and shaking time, the maximum recovery of zinc was found to be 97.8% using 25mL of 1.0M nitric acid as eluent. The adsorption parameters for zinc on the functionalized resin were analyzed using Langmuir, Freundlich and Temkin isotherm models. The adsorption isotherm was in good agreement with Langmuir and Freundlich model ( $R^2 > 0.98$ ). Each characteristic parameter of isotherms was determined. The kinetics of adsorption of zinc on functionalized resin has been investigated and the results revealed that the adsorption process follows pseudo second order kinetics. The stability and reusability of the functionalized XAD-4 resin has been investigated in 5.0M nitric acid. It has been found that the adsorption capacity of the acid treated resin was almost similar to that of the untreated resin. This result indicates that the resin can resist an acid concentration up to 5.0M. It can also be reused for several cycles without any significant change in the adsorption capacity.

## **Synthesis of cellulose acetate from different agricultural wastes by trans-esterification reaction**

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### **Abstract**

The present paper reports the synthesis of cellulose acetate from different agricultural wastes namely papaya stems and rice straw. Firstly,  $\alpha$ -cellulose fibres were isolated from papaya stem fibres and rice straw by Kraft pulping process followed by chlorite bleaching and alkali treatment respectively. The isolated  $\alpha$ -cellulose fibres were then used to synthesis cellulose acetate through trans-esterification reaction between OH group of cellulose and vinyl acetate monomer. The trans-esterification reaction i.e. acetylation of cellulose was confirmed by FT-IR analysis. The percentage of acetylation followed by degree of substitution was estimated by a chemical method. It was found that the acetate content was about 18% and the DS was 0.83.

**Keywords:** cellulose, cellulose acetate, degree of substitution, trans-esterification reaction.

## **The Amount of the Micronutrients in Soils and River Water of Gopalganj, Bangladesh**

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### **Abstract.**

The contaminations and exposures of some micronutrients are recognized as a risk to human health because of consumption of elements through water and environment. Thirteen composite samples include eight different waters and six soils were collected from the different places of Gopalganj, Bangladesh. These were digested and examined, in this study. Quantifications of different metals from the composite specimens were made using Atomic Absorption Spectrophotometer methods (AAS) against standard calibration plot. The frequency of metals were observed in the order of soil > waters. Soils samples provided higher concentration than water specimens for nine metals such as Pb, Cd, Cr, Cu, Fe, Mn, Zn, Ca and Mg. In contrast, increasing concentrations of Co, Ni, Na and K were observed in waters compared to soils. The lowest concentrations of metals were received from water samples. The Fe, Cr, Ni and Mn concentrations exceeded the approved admissible levels in soils specimens at least 1 to 2 orders of magnitude and rests were within permissible limit.

**Keywords:** Heavy Metals, Irrigated Soils, River Waters.

## **Thermal Conductivity Calculation of Black Phosphorene Monolayer: An NEMD (Non-Equilibrium Molecular Dynamics) Study**

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### **Abstract.**

Monolayer phosphorene holds great potential as a system for the study of thermal physics of two-dimensional electronic materials due to its novel electronic properties, such as layer-dependent direct bandgaps and relatively high carrier mobility. In this study, we performed non-equilibrium molecular dynamics simulations to model and calculate the thermal conductivity ( $\kappa$ ) in nanometer sized black phosphorene monolayer structure. This study includes the computation of thermal conductivity in both armchair and zigzag direction. The room temperature thermal conductivity of the pristine black phosphorene monolayer is calculated to be  $78.245 \text{ Wm}^{-1}\text{K}^{-1}$  in zigzag direction and  $21.976 \text{ Wm}^{-1}\text{K}^{-1}$  in armchair direction which come up in good agreement with the previous studies. Thermal conductivity is found to decrease with the increasing temperature while it tends to increase with the increasing length. Furthermore, we have investigated that the thermal conductivity is significantly higher in zigzag direction than that of in armchair direction. This work successfully unveils new insights to the anisotropic thermal conductivity along the two crystalline directions in phosphorene monolayer, which can be useful for better design of structures for nano-electronic, optoelectronics and other applications.

**Keywords:** Black Phosphorene, Armchair, Zigzag, NEMD, Thermal conductivity.



## Thermal Transport Characterization of Stanene by Non-equilibrium Molecular Dynamics (NEMD)

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### Abstract.

Silicene, germanene and stanene are two-dimensional allotropes of group-IV substrates which have recently attracted considerable attention in [nanostructure device](#) fabrication purpose. Stanene is a two-dimensional, graphene-like honeycomb structure material except of its buckled structure, has been synthesized in a recent experimental study. Because of its spin orbital coupling effect, it is characterized as a superconductive material at room temperature. As the electronic properties of stanene has already been explored, concentrating its thermal property is specifically compelling. In this study, we have modeled stanene nanosheet and subsequently characterized its thermal transport by using non-equilibrium molecular dynamics (NEMD) simulation to study stanene's length and temperature-dependent thermal conductivity. The room temperature thermal conductivity of stanene nano-structure is 9.67 W/mK which is two order smaller than graphene. The thermal conductivity of our studied nanostructure decreases with the increasing temperature whereas the thermal conductivity of the nanostructure is found to increase with the increasing length of the structure. The stanene nanostructure acknowledged in our investigation would give a decent knowledge and support into engaging possibility in the thermoelectric applications because of its low thermal conductivity.

**Keywords:** Stanene, NEMD, Thermal Conductivity, Nanosheet.

## **Review on Biosynthesis of SnO<sub>2</sub> Nanoparticle by Chemical Precipitation Method**

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### **Abstract**

Tin oxide (SnO<sub>2</sub>) with versatile properties is of substantial standing for practical application and improved features of the material is demonstrated in the current issue through integration of nanotechnology with bio-resources termed as biosynthesis of SnO<sub>2</sub> nanoparticles (NPs). This review reveals the recent advances in biosynthesis of SnO<sub>2</sub> NPs by chemical precipitation method focused on distinct methodologies, characterization and reaction mechanism along with photocatalytic application for dye degradation. Numerous bio-based precursors selectively extracted from biological substrates have effectively been applied as capping or reducing agents to achieve the metal oxide NPs extracted from available literature reviews. The major precursor obtained from the aqueous extract of *Catunaregam spinosa* root barks is found to be *7-Hydroxy-6-methoxy-2H-chromen-2-one* that has been proposed as a model compound for the reduction of metal ions into nanoparticles due to having highly active functional groups, eco-friendly, abundant in plants (67.475 wt%) and easy to extract. This work also describes the advances in the understanding of the bio-reduction mechanism of the synthesis. This review can be concluded that SnO<sub>2</sub> NPs have been prepared successfully from bio-resources. With this contribution, it has been perceived not only to provide an overview of the recent developments in the biosynthesis of SnO<sub>2</sub> NPs but also to indicate the main issues in need aiming to attract researchers in this field and show vision towards innovative outcomes.

**Keywords:** Nanoparticles, SnO<sub>2</sub>, Biosynthesis, Precipitation method, Reaction mechanism.

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**Preparation of Jute Stick-based Activated Carbon Supported Copper Oxide Nanoparticles for Hydrogen Storage in MgH<sub>2</sub> towards Automobile Application**

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**Abstract**

The generation of hydrogen fuel car is a burning issue in worldwide due to the rapid growth of energy demand and depletion of fossil energy resources, together with the need for a successful strategy to reduce the successive increase of greenhouse gas emissions require sustainable, renewable, and clean energy sources. Hydrogen is an ideal energy carrier in comprehensive zero-emission vehicles. Metal hydrides are a safe alternative for hydrogen storage due to their long-term stability and low hydrogen equilibrium pressures. Magnesium hydride (MgH<sub>2</sub>), for instance, has been considered as one of the most interesting materials for hydrogen storage due to high hydrogen storage capacity of 7.6 wt% and 102 gL<sup>-1</sup> and non-toxic properties. However, it cannot be used on-board due to two main reasons such as hydrogenation/dehydrogenation reaction for pure MgH<sub>2</sub> is very slow and occurs only at high temperatures (>600 K) under an equilibrium pressure of hydrogen much higher than 1 bar (>3 MPa). However, the operation condition can be improved by using metal oxide as additives which creates channels through MgH<sub>2</sub> surface. In our research we will use copper oxide nanoparticles (CuO-nano) supported by high surface area activated carbon (AC) with MgH<sub>2</sub> and suppose it will open a new window for hydrogen adsorption and desorption at normal temperature and pressure. Currently, activated carbon was successfully prepared from jute waste in our lab, that can be applied in the present issue to promote reversible H<sub>2</sub> uptake and release behavior of MgH<sub>2</sub>.

*Keywords: Hydrogen; Greenhouse gases; Metal hydride; hydrogenation; dehydrogenation*

## **Review on Production of the Jet Fuel from Plastic Waste by Catalytic Pyrolysis Process.**

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### **ABSTRACT**

Though plastic materials have shaped the modern world but its far-reaching negative impact in our environment cannot be unseen. Many movements and methods have been taken to minimize the negative impact of plastic wastes. Among them, one befitting way to minimize the impact of plastic waste by keeping in mind the continuous depletion of fossil fuel. Waste plastic has been effectively converted into jet fuel and hydrogen-enriched gases. Various pyrolysis methods with a wide range of different catalysts, such as zeolite, HZSM-5, sodium aluminum silicate, have been studied to produce liquid and recently activated carbon to produce gas fuel from plastics. In studies, it has been found that percentage of aromatics and release of hydrogen molecules greatly depends on catalytic cracking temperature, reactor type and method of pyrolysis. In this present work, we have done a comprehensive study of various thermal methods, temperature and reactor type from the literature to simulate a better reactor model and reaction conditions to achieve maximum jet fuel and hydrogen gas efficiency with activated carbon catalyst.

## **Eco-Friendly Nonconventional Adsorbents to Mitigate Toxic Metals and Organic Pollutants from Industrial Wastewater**

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### **Abstract**

Access to clean drinking water is a basic human need but as many as 750 million people in the world do not have access to it [1]. Freshwater sources are often contaminated by industrial waste, pesticides, fertilizers, and other pollutants such as microorganisms, heavy metals and other hazardous chemicals which make water unfit for human consumption and which can be a key factor in water-related diseases [2]. Among the various known forms of pollution, water pollution is of great concern since water is the prime necessity of life and extremely essential for the survival of all living organisms.

The rapid expansion of industries is the generation of large amount of wastewater containing number of toxic metal ions and aromatic compounds such as phenol and nitrobenzene which are polluting the fresh water continuously. This discharge of heavy toxic metals and organic pollutants into aquatic ecosystems has become a matter of great concern in Bangladesh over the past few decades. These heavy toxic metals and organic pollutants are generated by dental operations, food processing, electroplating industries, leather tanning, textiles, paper and pulp industry and are potentially toxic to humans [3]. The availability of clean water for various activities is becoming the most challenging task for researchers and practitioners worldwide. Most of the heavy metals, Arsenic (As), Cadmium (Cd), Lead (Pb), Mercury (Hg) and organic pollutants discharged into the wastewater are found toxic and carcinogenic and cause a serious threat to the human health [4]. Organic pollutants in the ecosystem, especially persistent organic pollutants (POPs), are of the most important environmental problems in the world. These include pesticides, fertilizers, hydrocarbons, phenols, plasticizers, biphenyls, detergents, oils, greases, pharmaceuticals, proteins and carbohydrates [5-7]. The literature reviewed revealed that the release of large quantities of hazardous materials into the natural environment has resulted in a number of environmental problems and due to their non-biodegradability and persistence, can accumulate in the environment elements such as food chain, and thus may pose a significant danger to human health.

The most widely used conventional methods for removing heavy metals from wastewater include ion exchange, chemical precipitation, reverse osmosis, evaporation, and membrane filtration. But most of these methods suffer from some drawbacks, such as high capital and operational cost or the disposal of the residual metal sludge, and are not suitable for small-scale industries [8]. Besides high capital and operational cost conventional methods have inadequate efficiencies at low concentrations, particularly in the range of 1–100 mg/l [9-11].

In the present work, the removal of toxic metal ions and organic pollutants from industrial discharge water by adsorption technique using different safe and eco-friendly adsorbents has been investigated. Activated carbons (AC) (both granular activated carbon (GAC) and powdered activated carbons (PAC)) are common adsorbents used for the removal of undesirable odor, color, taste, and other organic and inorganic impurities/pollutants from domestic and industrial wastewater owing to their large surface area, micro porous structure non-polar character and due to its economic viability.

Efficient techniques for the removal of highly toxic organic compounds from water and wastewater have drawn significant interest. Adsorption is recognized as an effective and low cost technique for the removal of heavy metals and organic pollutants from water and wastewater, and produce high-quality treated effluent. The process is suitable even when the metal ions are present in concentration as low as 1mg/l [12]. This chapter highlighted for the removal of toxic metal ions and organic pollutants using adsorption technique with different kinds of agro/natural wastes and abundant sorption material known as bio-sorbents. Sorption performances were evaluated through classical adsorption equilibrium isotherms and kinetics. However, the cost of adsorbent becomes relatively high when pure sorbents are used therefore there is an increasing trend for substituting the pure sorbents with natural by-product in order to make the process economically feasible.

Design of experiment technique was used to determine model equations describing the removal efficiencies of mixture of the target metals with respect to operating conditions such as pH, metal concentration, and the dose of the adsorbents. The Process optimization helped to evaluate the simultaneous effects of pH, initial metal concentration, and the dose of the adsorbents. Characterization of metal-biomass interactions responsible for the bio-sorption has been studied employing BET, FT-IR and SEM techniques.

**Keywords:** Bio-sorption; Heavy metals; Langmuir isotherm; Sorption kinetics; Persistent organic pollutants (POPs).

## Screening of Shrimp at Different Stages in Different Regions for Identification of Prohibited Antibiotic Residue

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### Abstract

An experiment was undertaken to analyze the existence of antibiotic residue in shrimp muscle from different farms of Khulna, Sathkhira and Bagerhat region by using ELISA method. Screening test was conducted in the Quality Control Laboratory of the Department of Fisheries, Bangladesh. The concentration (ppb) of chloramphenicol (CAP), nitrofurans metabolites (AOZ, AMOZ, SEM, AHD) and tetracycline in PL, PL after 1 week, after 1 month and harvesting before 1 week were analyzed. The concentration (ppb) of CAP was varied from 0.001 to 0.013 in Sathkhira region, 0.001 to 0.015 in Khulna region and 0.003 to 0.016 in Bagerhat region, where the cut-off level was 0.109. The concentration (ppb) of SEM was varied from 0.059 to 0.228 in Sathkhira region, in Khulna region it was 0.022-0.920 and in Bagerhat region it was 0.156-0.396, where the cut-off level was 0.576. The concentration (ppb) of AOZ was varied from 0.044 to 0.145 in Sathkhira region, 0.029 to 0.077 in Khulna region and 0.032 to 0.088 in Bagerhat region, where the cut-off level was 0.371. AMOZ concentration (ppb) was ranged between 0.046 and 0.165 in Sathkhira region, 0.035 and 0.087 in Khulna region, and 0.044 and 0.092 in Bagerhat region, where the cut-off level was 0.374. The concentration (ppb) of AHD was varied from 0.014 to 0.055 in Sathkhira region, 0.001 to 0.048 in Khulna region and 0.004 to 0.073 in Bagerhat region, where the cut-off level was 0.424. However, the test revealed that nitrofurans and chloramphenicol antibiotics were found in shrimp muscle but maximum concentration was lesser in quantities. Only SEM was found in higher concentration in shrimp PL and PL after one week in one farm of Khulna district that was 0.723 and 0.920, respectively. Despite this, the next stages (after one month & harvesting before one week) did not contain harmful level of the residue. Tetracycline was not detected in shrimp muscle. Increased aquaculture practice has resulted in increased levels of infections among species. Various classes of antibiotics exhibit activity against both Gram-positive and Gram-negative bacteria; therefore, they are widely used in aquaculture to treat or prevent diseases. Although in the present study, most of the antibiotic residues were found at the very minimum level to be acceptable for human consumption, yet proper and advanced level management systems are the necessity to prevent future contamination in large scale.

**Key Words:** Shrimp, different stages, different region, prohibited, antibiotic residue, ELISA

## **Influences of different microalgal diets on the survival and growth of an edible sea urchin *Tripneustes gratilla* (Linnaeus, 1758) larvae in captivity**

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### **Abstract.**

An experiment was undertaken to investigate the influence of different microalgal diets on survival and growth of the edible sea urchin (*Tripneustes gratilla*) larvae in a controlled laboratory condition. The sexually matured adult sea urchins, weighing from 60 to 370 g were collected from the subtidal region of Bum Bum Island near Semporna, Sabah at low tide during October 2015 to May 2017. Gametes were obtained from adult sea urchins by injecting 0.5 M KCl into the coelomic cavity and fertilization of eggs was performed at 10<sup>-5</sup> dilution of 'dry' sperm. The resulted embryos and larvae were reared at 26-28°C, and when the larvae attained 4-armed pluteus stage, they were fed with different microalgal diets (i.e. *Chaetoceros calcitrans* (CC), *Isochrysis galbana* (Iso). and *Nanochloropsis* sp. (Nano), i.e. a variety of both single and mixed microalgal species were tested to identify the best diet for optimal growth and survival of *T. gratilla* larvae until attaining metamorphic competence within 35 days post-fertilization. The morphometric changes of different larval stages (viz, Larval Length-LL, Body length-BL, Total Width-TW, Stomach Length-SL, Post-oral Arm -POA, Posterior Dorsal Arm-PDA, Pre-oral Arm-PRA, and Anterior Lateral Arm-ALA), fed with different planktonic diets were measured and the survival rates of the competent larvae were estimated to compare the larval growth and the survivability. Larvae fed a mixed algal diet with CC + Iso and a single diet with CC showed significantly better growth than those of other treatments. Larvae attained the metamorphic competency, while fed with both the mixed species of CC + Iso and the single species of CC within 35 days of culture. During the 1<sup>st</sup> sampling (10 days after the fertilization), survival rate of larvae was found to be the highest in CC followed by Iso + CC and the lowest in Nano, however, no larvae were survived while fed with Nano after this. Overall, the highest survival (64.28 %) was found in the competent larvae, fed with single algal diet of *C. calcitrans*, followed by 61.90 % with mixed diet (*C. calcitrans* and *I. galbana*), while the lowest value (25.0 %) was obtained in the larvae, fed with *Nanochloropsis*. The results obtained from this study revealed that the single microalgal species (*C. calcitrans*) and mixed algal species (*C. calcitrans* and *I. galbana*) were the best diets for the optimum growth and survival of *T. gratilla* larvae, the findings of which will ultimately be helpful towards the quality seed production and commercial aquaculture of sea urchins.

**Key Words:** *Tripneustes gratilla*, microalgae, survival, growth, aquaculture