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Message



Abraham Debebe (Ph.D.), the vice president for research and technology transfer

Dear readers,
Warm Greetings!

Addis Ababa Science and Technology University (AASTU) is established to aspire the economic development of the country. In order to fulfil this ambition, AASTU established eight

Centers of Excellence (CoEs), which include Artificial Intelligence and Robotics (AI&R), Biotechnology and Bioprocessing (BT&BP), High Performance Computing and Big Data Analysis (HPC&BDA), Construction Quality and Technology (CQT), Nanotechnology (NT), Mineral Exploration, Extraction and Processing (MEEP), Sustainable Energy (SE), and Nuclear Reactor Technology (NRT).

I am pleased to inform you that the second issue of Volume One of the Research and Innovation (R&I) newsletter has been released with lot's of information for the readers. The second issue contains updates on the latest research and innovation activities at AASTU, research spotlight, research highlights, and information regarding upcoming events. The R&I newsletter is an important platform to share the major achievements of the university with the broader community. I encourage you to read the newsletter and share it with your colleagues. I look forward to your contribution to the next edition and your association with AASTU for better future.

News

Collaboration between Addis Ababa Science and Technology University and Youngnam University

A team of twenty South Korean scholars from Youngnam University, majorly professors, visited the Addis Ababa Science and Technology University (AASTU) to discuss on future collaborations in Research and Development, and innovation in science and technology. The experts introduced their specialties and discussed their Achievement in their field of studies. Abraham Debebe (Ph.D.), the vice president for research and technology transfer, welcomed the guests and presented the past, present, and future plans of the AASTU. Abraham spoke about the way to collaborate with the installation and development of laboratory equipment in the center of Excellencies. Professor Kim, Vice President of Youngnam University, also invited AASTU to collaborate in different fields of research in science and technology with his university.

Participants from both universities had the chance to share their knowledge and experience in the fields of science and technology during the visit. The experts from Korea delineated their areas of expertise and research interests, mentioning their collaboration in fields such as solar energy, food science, nutrition, natural and forest products, textile technology, and sustainable energy. Youngnam University is a leading university in South Korea that offers a wide range of programs in science and technology.

The collaboration between the two universities will help to promote scientific research and development in Ethiopia and South Korea. The exchange of knowledge and expertise will help to create new opportunities for students and researchers in both countries. Both AASTU and Youngnam University are committed to working together to promote scientific research and development in their respective countries.

The visit by the South Korean teams is a testament to the growing interest in science and technology in Ethiopia. AASTU is playing a key role in promoting science and technology education in the country. The university is committed to producing competent researchers and proficient trained workforce for the industries in particular and the country in general. The collaboration with Youngnam University will help to further this goal and promote scientific research and development in Ethiopia.

In conclusion, the visit by the South Korean teams from Youngnam University to the AASTU was a successful event that will help to promote scientific research and development in Ethiopia. The collaboration between the two universities will help to create new opportunities for students and researchers in both countries and promote scientific research and development in their respective countries.



Fig. 1 Yong won (Professor, Vice president for International Affairs, Youngnam University) Introduction of his program and his team.

Research Ethical review

The Addis Ababa Science and Technology University Institutional Ethical Approval Board (AASTU-IEAB) has given an orientation on research ethics and an overview of the processes involved in getting ethical approval for grant recipients for researchers. According to AASTU IEAB chair, ethically approved research is essential for the protection of participants and the integrity of the research process. It has several benefits for individual researchers and AASTU, including enhancing the quality and credibility of research, protecting researchers from potential legal and ethical issues, and enhancing the reputation and credibility of AASTU. It can also help to attract funding and collaborations from other institutions and organizations that value ethical research practices. In the 2nd quarter, 16 applicants have received a certificate, of which three are conditionally approved.

Consultative meeting organized by The Mineral Exploration, Extraction, and Processing Center of Excellence of AASTU

The Mineral Exploration, Extraction, and Processing Center of Excellence of AASTU and the African Union held a forum on November 6th, 2023, at Addis Ababa Science and Technology University on the implementation of the African Union commodity strategy and its action plan. According to Daniel Meshesha (PhD), Head, Mineral Exploration, Extraction, and Processing Center of Excellence (MEEP CoE), and Mr. John Youhanes Magok, Expert on Minerals Resources Development, Department of Economic Development, Trade, Tourism, Industry and Minerals, African Union Commission, the theme of the meeting is "AFRICAN COMMODITY STRATEGY: Leveraging Research and Development to Strengthen Commodity Regional Value Chains."

Dereje Engida (PhD), President of Addis Ababa Science and Technology University, and Chiza Charles Chiumya, Director for Industry, Minerals, Entrepreneurship, and Tourism, African

Union Commission, made a welcome address. In this forum, a forum's lecture and opening remarks are made by H.E. Amb. Albert M. Muchanga, the Commissioner for Economic Development, Trade, Tourism, Industry, and Minerals of the African Union Commission, under the theme "AFRICAN COMMODITY STRATEGY: Leveraging on Research and Development to Strengthen Commodities Regional Value Chains," and Abreham Debebe (PhD), Vice President of Research and Technology Transfer, AASTU, on Strengthening Research Capacity of AASTU: Challenges and Opportunities from the Perspectives of African Commodity Strategy Implementations.

In the session, six experts presented their work:

- Ms. Judith Ameso, Officer in Charge, Regional Office for Africa, UNCTAD
- Girma W/Tensea (PhD), from AASTU, presents on mineral commodities in Ethiopia and value addition.
- Daniel Meshesha (PhD, Head, the MEEP CoE) presented mechanisms to promote linkages between centers of excellence and the commodities industries.
- Aurelia Patrizia Calabro, UNIDO Representative to the African Union. Topic: Promoting the use of cleaner technologies and information and communication technology (ICT) along the commodity value chains
- Melaku Geboye Desta (PhD), Coordinator, African Trade Policy Center, presented on Fostering research and innovation to penetrate new markets for African commodities.

Consultative workshop on the prefeasibility study of AASTU's Nuclear research reactor is organized by Nuclear Reactor CoE

On December 20th –21st, 2023, a Consultative Workshop on Pre-Feasibility Study for Establishment of AASTU Nuclear Research Reactor was held by the Nuclear Reactor COE in collaboration with KAERI and KONICOF. Dereje Engida (Ph.D.), President of AASTU, and His Excellency Seok Hee Kang, South Korean Ambassador, have made a welcome and opening speech and congratulatory remarks, respectively. The workshop was aimed at discussing the es-

tablishment of the AASTU Nuclear Research Reactor (N.R.R.), sharing Korean experiences in N.R.R. projects, operation, and utilization, and discussing future cooperation between AASTU and KAERI in the area of N.R.R. The workshop was attended by various experts in the field, including Prof. DongSeong SOHN, the Head of Nuclear Reactor COE, who presented the preliminary feasibility study for AASTU Research Reactor. In addition, Dr. Cheol PARK and Ms. NaHeun KIM presented a brief introduction on KAERI and KONICOF, respectively. The workshop also featured eight papers from different institutions, including St. Paul's Hospital Millennium Medical College, Black lion Hospital, AAU, MINT, the private sector, and Korean experts. The workshop was a great opportunity for experts to share their knowledge and experiences in the field of nuclear research reactors. Tilahun Tesfaye (Professor, AAU) presented on Ethiopian Experience in Nuclear and Radiation Laboratories and the Need for a University Research Reactor, and Abeba Getu (NLO to IAEA, MINT) presented on Ethiopian Bilateral and International Collaborations for the Development of Nuclear Science and Technology for Peaceful Applications: Trends and Prospects. Ejigu Kebede (Ph.D.) presented on "Infrastructure Development for the Provision of Nuclear Medicine Services in Ethiopia: The Case of St. Paul's Hospital Millennium Medical College." Henok Sime (Ph.D.) discussed the "Utilization of Radiotracers and Neutron Activation Analysis in the Mining Industry of Ethiopia: Trends and Challenges." Nardos Mekoya presented on the topic "Trends and Expected Demands for the Use of Non-destructive Testing (NDT) in Ethiopian Industry," emphasizing the importance of non-destructive testing techniques in various industries. Surur Kedir's presentation on "Ethiopian Regulations and Requirements Related to University Research Reactors" shed light on the regulatory framework and requirements specific to university research reactors in Ethiopia. Yohannes Jorge's presentation on "Trends on the Supply and Demand for Medical Radioisotopes, Radiopharmaceuticals, Radiological and Nuclear Medicine Services in Ethiopia" provides valuable insights into the current sta-

tus and future prospects of these crucial medical services.

It is hoped that the workshop will lead to further cooperation between AASTU and KAERI in the area of N.R.R. and contribute to the development of nuclear research reactors in Ethiopia.



Figure 2. Partial view of the participants

Ethiopian Norwegian network in computational mathematics (ENNCaMat) organized Training

The Ethiopian-Norwegian network in computational mathematics summer school and project development training was conducted at Addis Ababa Science and Technology University from the 27th of November to December 8th, 2023 in two phases. The Norwegian University of Science and Technology and Hawassa University, in collaboration with Addis Ababa Science and Technology University, Arbaminch University, and Adama Science and Technology University, organized the school and the training on computational mathematics. The School was officially opened by Abraham Debebe (P.h.D.), vice president for research and technology transfer and the training was provided by professors, and Ph.D. students who come from the Norwegian University of Science and Technology. According to Surafel Leulseged (Ph.D.), the head for HPC and Big data analysis CoE, this training aimed to build the capacity to find the problems in the industry and inform them to solve the problem with the aid of mathematical applications. During the two weeks of training, representatives from industries also attended and discussed with experts on solving problems experienced in the industry.



Figure 3. The participants

36th Annual Congress and 40th Year of the Chemical Society of Ethiopia

The 36th Annual Congress and 40th Anniversary of the Chemical Society of Ethiopia (CSE) were held at Addis Ababa Science and Technology University, organized by the Nanotechnology Center of Excellence and the Department of Industrial Chemistry, AASTU, in collaboration with the Chemical Society of Ethiopia (CSE).

The congress kicked off with a warm welcome speech by Dr. Yedilfana, the Vice President of CSE, who highlighted the exceptional significance of this twofold event, marking both the momentous anniversary and the annual congress of the society. This gathering provided a unique opportunity to reflect on the achievements and contributions of CSE over the past four decades.

In his introductory remarks, Dereje Engida (Ph.D., President of AASTU) recognized the Chemical Society of Ethiopia as a preeminent professional organization that has significantly aided in the advancement of the country as a whole. In his speech, he underlined how crucial chemistry is to sustainable development and how the Chemical Society of Ethiopia promotes scientific discoveries.

According to Getachew Adam (Ph.D., Research and Center of Excellence Directorate Director, Coordinator of the conference, Executive member of CSE), the distinguished professors and entrepreneurs were invited as keynote and planetary speakers, namely, Birhanu Abegaz (Professor, AAU), Teketel Yohannes (Professor,

ESA), Bekele Tsegaye (Entrepreneur), Aman Dekebo (Professor, ASTU), Abi Tadesse (Haramaya University), Temechegn Engida (Professor, UN-ESCO), and Yonas Chebude (Professor, AAU).

Consultative workshop organized by Bioprocessing and Biotechnology Center Excellence

A consultative workshop titled “The Power of Microbiomes of Extreme Agroecologies of Ethiopia in Sustainable Bioeconomy” was conducted by the Bioprocessing and Biotechnology Center of Excellence on December 26 at Addis Ababa Science and Technology University. The opening remark was given by Abraham Debebe (Ph.D.), Vice President of Research and Technology Transfer at AASTU. Subsequently, Fasil Assefa (Ph.D., Professor), AAU, gave the keynote lecture, and several researchers gave presentations on various topics, namely: application of microbes from extreme environments in bioproducts development (Ketema Bacha, Ph.D., Professor, Jima University); the role of the microbiome of extreme habitats in the enhancement of stress tolerance in agricultural crops (Diriba Muleta, Ph.D., AAU); Biotechnological applications of microbial enzymes and bio-cement in construction (Mesfin Tafesse, Ph.D., AASTU), The role of indigenous microbial fungicides in sustainable coffee production in Ethiopia (Tesfaye Alemu, Ph.D., AAU), Exploiting the Microbiome for Revitalizing Ethiopia’s Agriculture (Dejene Girma, Ph.D., EIAR), Promoting major activities of ISME (Mesfin Tafesse, Senior Country Ambassador of ISME), and a closing remark was made by Girma Gonfa (Ph.D.), the Head Bioprocessing and Biotechnology CoE.

News from Community Engagement Directorate Training on development planning

Members of the Akaki Kaliti Sub-City Planning Team have received training in local development planning (LDP/NDP) from the Community Engagement Directorate in association with the Center of Excellence for Construction Quality and Technology.

Director of Community Engagement, Kenatu (Ph.D.) asserts that AASTU staff with extensive backgrounds in their fields of study led the training. Based on the feedback from the trainees, they felt that they had a sufficient understanding of the topics covered over the three days of training, which will enable them to use the knowledge in their offices or workplaces when they return. Vice President for Research and Technology Transfer Dr. Abraham Debebe declared the three-day LDP/NDP training program to be successfully completed, formally ending the training session.

STEM education training

In two rounds, 150 secondary high school teachers attended STEM education training from Addis Ababa Science and Technology University in partnership with STEM Synergy in Ethiopia. Over the course of the three days of instruction, a wide range of subjects were covered, including raising awareness, capacity building in STEM, utilization of laboratory resources, and strategies to enrich their students’ learning towards the overall goal.

The STEM training program has been attended by 330 students from diverse backgrounds from October 28 to December 23, 2023. These students were from nearby schools, and the course has been divided up into three sections. Courses in biology, chemistry, mathematics, and physics are offered at the first level. Solid work, robotics, electronics, and embedded courses are the main emphasis of the second level. Third-level students were required to actively participate in projects as part of their training, in addition to their study.

AASTU secured first and third place in 8th National Science Fair Competition

The 8th National Science Fair competition was held from November 13 to 17, 2023, and was jointly organized by the Ministry of Education, stakeholders, and Addis Ababa Science and Technology University. Students from AASTU’s STEM Center participated in the fair and achieved remarkable success. The STEM Center received a certificate of recognition as the second-best center in the competition, and the

students from the STEM Center secured first and third positions in the competition. This achievement is a testament to the quality of education and training provided by the STEM Center at AASTU. The competition was an opportunity for students to showcase their knowledge and skills in science and engineering and to compete with similar institutions. The STEM Center's success in the competition is a reflection of the hard work and dedication of the students and faculty members. Congratulations to the STEM Center at AASTU for their outstanding performance in the competition!



Figure 4. Certification of trainees



Figure 5. AASTU chemistry laboratory



Figure 6. Student from the AASTU STEM Center placed first and third in the National science Fair competition



Spotlight

Self-healing performance of normal strength concrete with *Bacillus subtilis* bacteria

Zamba, D. D., & Mohammed, T. A. (2024). Self-healing performance of normal strength concrete with *Bacillus subtilis* bacteria. *Journal of Building Pathology and Rehabilitation*, 9(1), 4.

The use of bacteria to improve the mechanical and durability properties of concrete was investigated in this study. *B. subtilis* bacteria were incorporated into normal-strength concrete at a concentration of 10^8 cells/mL. A total of 66 concrete specimens were cast and tested for mechanical and durability properties (compressive strength, flexural strength, UPV, water absorp-

tion, acid resistance, and salt resistance) at 7, 14, 28, and 56 days. Cracked specimens were also examined using a 3D optical microscope until the cracks were healed. The results showed that the addition of bacteria to concrete significantly improved its mechanical and durability properties. The compressive, flexural, and UPV values of concrete with bacteria increased to 19.55%, 15.25%, and 5.40%, respectively, compared to the control group at 28 days of curing. At 56 days of curing, the acid and salt resistance of concrete with bacteria increased to 11.38% and 18.78%, respectively. Examination of the cracks in the bacterial concrete using a 3D optical microscope revealed a large white crystalline deposit that almost filled the surface of the crack. This is due to the *B. subtilis* bacteria producing calcite precipitation, which fills concrete cracks. Overall, the results of this study showed that the use of *B. subtilis* bacteria can significantly improve the mechanical and durability properties of concrete. This makes bacterial concrete a promising material for use in a variety of applications, such as infrastructure, construction, and civil engineering.

Key Findings:

- Improved crack closure: Concrete containing *Bacillus subtilis* bacteria exhibited significant crack closure compared to control samples without bacteria. The bacterial calcite production effectively plugged minor cracks, reducing their visibility and potential for further damage.
- Enhanced compressive and flexural strength: The addition of bacteria led to a slight increase in both the compressive and flexural strengths of the concrete. This suggests that bio-mediated crack healing can not only prevent structural deterioration but also improve overall mechanical performance.
- Durability against freeze-thaw cycles: Concrete specimens with bacteria displayed superior resistance to freeze-thaw for infrastructure in cold climates. The self-healing mechanism mitigated internal ice formation and subsequent micro-cracking, promoting long-term structural integrity.

Significance:

This research demonstrates the promising potential of bio-based self-healing technologies for improving the sustainability and performance of concrete infrastructure. Implementing *Bacillus subtilis* bacteria could lead to:

- Reduced need for repair and maintenance: self-healing concrete can extend the lifespan of structures, minimize repair costs, and decrease the environmental impact associated with frequent interventions.
- Enhanced infrastructure resilience: Improved crack resistance and freeze-thaw durability can make structures more resilient to environmental stresses and extreme-weather events.
- Development of eco-friendly construction materials: Bio-based self-healing technologies offer a sustainable alternative to traditional repair methods, potentially reducing reliance on carbon-intensive materials and practices.

Overall, this study paves the way for exciting advancements in concrete technology, potentially leading to more durable, sustainable, and resilient infrastructure in the future.

Research Highlights

Hydrochemistry and quality appraisal of groundwater in Birr River Catchment, Central Blue Nile River Basin, using multivariate techniques and water quality indices

Fentahun, A., Mechal, A., & Karuppannan, S. (2023). Hydrochemistry and quality appraisal of groundwater in Birr River Catchment, Central Blue Nile River Basin, using multivariate techniques and water quality indices. *Environmental Monitoring and Assessment*, 195(6), 655.

Due to the continuous population growth and the expansion of industry and agriculture in Ethiopia, groundwater demand has been increasing to supplement the erratic surface water. Therefore, the availability of sufficient and clean groundwater should be appraised and tracked regularly to secure its multi-purposes. This work aims to assess the appropriateness

of groundwater for drinking, and irrigation uses and identifies the key factors controlling groundwater quality in the Birr River Catchment (BRC), Blue Nile River Basin, Ethiopia. For this purpose, a total of 79 groundwater samples were assessed for physicochemical parameters. Major ion analysis, multivariate techniques (MCA, HCA, and PCA), and multi-hydrochemical indices were applied in the analysis of groundwater quality data. Hydrochemical analysis indicated that the principal cation and anion were Ca^{2+} and HCO_3^- , respectively. The spatial analysis of the major ions revealed a positive trend for Mg^{2+} , Na^+ , K^+ , HCO_3^- , Cl^- , and SO_4^{2-} along the groundwater flow path from the upland to the Birr river valley. Conversely, Ca^{2+} shows a deleterious tendency along the groundwater flow direction. The aquifer has three principal hydrochemical facies: Ca-HCO_3 , Ca/Mg-HCO_3 , and Na-HCO_3 . The water quality analysis indicates that with the exception of TDS, Ca^{2+} , Mg^{2+} , and HCO_3^- in a few locations, most of the parameters analyzed are within the WHO allowable limits and are thus considered suitable for drinking water. The combined use of Gibbs and ionic ratio plots confirmed that silicate weathering was invariably prevailing in the region. The Chloro-Alkali Indices (CAIs) have indicated that cation exchange occurs in more than 85% of groundwater samples. However, there were indications of the influence of reverse ion exchange in the rest of the data. The MCA, PCA, and HCA disclosed that geo-genic sources accompanied by human activities mainly control the groundwater quality of the catchment. However, water quality assessment indices show that groundwater in the highest proportion of the catchment is suitable for human consumption and agricultural use.

Geochemistry of Kolme granitoids: Implication for crustal growth in the Mozambique orogenic belt of southwestern Ethiopia

Zemene, D., Chekol, T., & Meshesha, D. (2023). Geochemistry of Kolme granitoids: Implication for crustal growth in the Mozambique orogenic belt of southwestern Ethiopia. *Journal of African Earth Sciences*, 198, 104819.

Petrological and geochemical (major and trace element) data are presented for Kolme granitoid from the Precambrian terrain of southwestern Ethiopia. Integrated field and petrochemical studies have been carried out to assess the source and discriminate tectonic setting of the granitoid as well as evaluate their implication for crustal growth. The petrological and the geochemical data indicate the presence of two groups of granitoid in the area: Borkara granitoid (BG) and Matera granitoid (MG). BG is granite in composition with higher SiO₂ content (75.27–78.51 wt %), lower Al₂O₃ (13.05–13.45 wt %), and FeO*/(FeO*+MgO) @ 0.92–0.94 wt %. BG is a high-K calc-alkaline, peraluminous, ferroan, and felsic I-type granitoid. Whereas MG is quartz-monzonite in composition with lower SiO₂ (66.03–69.16wt %) and higher Al₂O₃ (14.85–16.25 wt %) and FeO*/(FeO*+MgO) (0.96–0.97wt %). MG is shoshonitic, metaluminous to peraluminous, alkalic, ferroan and mafic I-type granitoid. BG is derived from the partial melting of upper continental crust with the contribution of melts from subducted slab and asthenospheric mantle wedge, while MG is derived by fractional crystallization of mantle-derived mafic magma underplated in the lower crust with minor crustal involvement.

The tectonic discrimination diagrams for Kolme granitoid infer that BG is a syn-orogenic granitoid, while the MG is a post-orogenic granitoid. Moreover, the transition from syn-orogenic calc-alkalic BG magmatism to alkalic MG magmatism is marking the end of the syn-collisional stage and the beginning of the extension of the Neoproterozoic crust.

Cervical Cancer Stages, Human Papillomavirus Integration, and Malignant Genetic Mutations: Integrative Analysis of Datasets from Four Different Cohorts

Mohammed, F. A., Tune, K. K., Jett, M., & Muhie, S. (2023). Cervical Cancer Stages, Human Papillomavirus Integration, and Malignant Genetic Mutations: Integrative Analysis of Datasets from Four Different Cohorts. *Cancers*, 15(23), 5595.

Cervical cancer represents a significant global health concern, stemming from persistent infections with high-risk types of human papillomavirus (HPV). The understanding of cervical cancer's clinical correlates, risk factors, molecular mechanisms, stages, and associated genetic mutations is important for early detection and improved treatment strategies. Through integrated analysis of clinical and molecular datasets, this study aims to identify key factors that are overlapping and distinct across four cohorts of different races and regions. Here, datasets from four distinct cohorts of patients from Uganda (N = 212), the United States of America (USA) (N = 228), China (N = 106), and Venezuela (N = 858) were examined to comprehensively explore the relationships between cervical cancer stages, HPV types (clades), productive HPV integration, and malignant genetic mutations. Cohort-specific findings included the occurrence frequencies of cervical cancer stages and grades. The majority of patients from the USA and China were diagnosed with stages I and II, while those from Uganda were diagnosed with stages II and III, reflecting levels of awareness and the availability of HPV vaccines and screening services. Conversely, cervical cancer and its stages were positively correlated with HPV types (clades), HPV integration, and risk-factor habits across the cohorts. Our findings indicate that the more common squamous cervical cancer can be potentially due to productive HPV16 (clade 9) integration. At the molecular level, pathways related to HPV infection, cancer-related conditions, and viral carcinogenesis were among the most significant pathways associated with mutated genes in cervical cancer (across cohorts). These findings collectively corroborate the prominent role of HPV infection and integration leading to genetic mutation and hence

Multi-source product distribution with disconnection constraints using swarm intelligence

Tilahun, S. L. (2023). Multi-source product distribution with disconnection constraints using swarm intelligence. *International Journal of Services Technology and Management*, 28(5-6), 389-409.

Product distribution is one of the main components of supply chain management. The problem is to find the optimal way of distributing products from production centres or sources to a number of demand centres. Often these sources can be multiple. The problem can be formulated using a combinatorial optimization model. Hence, in this paper, a multi source product distribution problem and its corresponding combinatorial optimization model will be studied. A swarm-based metaheuristic algorithm is modified and used to find a solution for the formulated problem. Datasets are generated to be used in future studies on testing algorithms as well as comparing their performance. The paper assumes an almost equal working load for each of the trucks. Dummy demand centres are used to meet this assumption in cases where the number of demand centres is not evenly divided for the trucks. Simulation is done based on the generated datasets. Simulation results show that the approach produces promising solutions with the cost function to reduce through the iterations.

Fatty acid methyl esters production from crude waste frying oil using modified coffee husk ash catalyst: Parameters optimization

Bekele, D. T., Shibeshi, N. T., & Reshad, A. S. (2023). Fatty acid methyl esters production from crude waste frying oil using modified coffee husk ash catalyst: Parameters optimization. *Results in Engineering*, 20, 101627.

In this study, a KNO₃-loaded coffee husk (CH) ash catalyst was synthesized to produce waste frying oil methyl ester (WFOME) from crude waste frying oil (WFO). Taguchi method optimization was performed to identify the best set of reaction temperature, time, catalyst loading and methanol to WFO molar ratio for maximum WFOME yield. A catalyst composite material

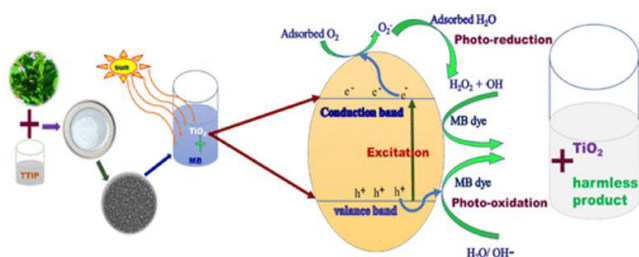
(CCM) which is a mixture of CH char and KNO₃ (0–65 wt%) was calcined to obtain the catalyst. The KNO₃ loading and CCM calcination time effects on the catalyst performance and physicochemical properties were examined. The combustion behavior of the CH and CCMs was investigated using thermal analysis techniques. Utilizing FTIR, XRD, BET, SEM, and pH measurements, the catalyst characterization was carried out. For analytical sample sizes (during thermal analysis) with high KNO₃ loading, the thermal reactivity was higher. However, for larger sample sizes (during catalyst synthesis) higher KNO₃ loading decreased the CCM global thermal reactivity due to an oxygen permeation resisting ash deposition on the top surface. Thus, KNO₃ tuned the catalyst's physicochemical properties as a function of its loading (optimum 45 wt%) by affecting the combustion characteristics of the CCMs and basic site concentration. The optimum WFOME yield was 97.99 wt% at a reaction temperature of 65 °C, a reaction time of 1.13 h, a catalyst loading of 5.42 wt%, and a methanol to WFO molar ratio of 13.55:1. The WFOME yield was dropped by 46.93 wt% in three consecutive catalyst reuse tests because of active components leaching.

Green Synthesis of TiO₂ Using *Impatiens rothii* Hook.f. Leaf Extract for Efficient Removal of Methylene Blue Dye

Yitagesu, G. B., Leku, D. T., & Workneh, G. A. (2023). Green Synthesis of TiO₂ Using *Impatiens rothii* Hook.f. Leaf Extract for Efficient Removal of Methylene Blue Dye. *ACS omega*

In this work, TiO₂ nanoparticles (NPs) were effectively synthesized by a green method using the *Impatiens rothii* Hook.f. leaf (IL) extract as a capping and reducing agent. The as-synthesized TiO₂ NPs were characterized by different characterization methods such as the Brunauer–Emmett–Teller (BET) analysis, high-resolution transmission electron microscopy (HR-TEM), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS), diffused reflectance spectroscopy (DRS), and

X-ray diffraction (XRD) and Raman spectroscopy. The specific surface area from BET analysis was found to be 65 m²/g. The average crystallite size from XRD analysis and average particle size from SEM analysis were found to be 11 and 25 nm, respectively. The Raman spectroscopy and XRD results showed that the biosynthesized (IL-TiO₂) nanoparticles were purely anatase phase. XPS analysis illustrated the formation of Titania with an oxidation state of +4. The DRS study showcased that a blue-shifted intense absorption peak of IL-TiO₂ (3.39 eV) compared to the bulk material reported in the literature (3.2 eV). HR-TEM micrograph showed the presence of grain boundary with d spacings of 0.352, 0.245, and 0.190, which correspond to the lattice planes of (101), (004), and (200), respectively. From the EDX analysis, the weight percents of titanium and oxygen were found to be 54.33 and 45.67%, respectively. The photoinduced degradation of methylene blue (MB) dye was investigated in the presence of biosynthesized IL-TiO₂ NPs photocatalyst. The effect of parameters like catalyst dosage (30 mg/L), initial concentration of MB (15 ppm), pH (10.5), and contact time (100 min) on the removal efficiency was optimized. The maximum photodegradation efficiency under the optimized conditions was found to be 98%.



Upcoming Events

Annual research conference

From May 16-17, 2024, AASTU will hold its annual research conference with the theme Science, Technology, and Innovation for Industry (STII 2024).

Training

The Research and Center of Excellence Directorate office is planning to provide a capacity building training for the University research community. The training will cover topics such as grant management, research ethics, research publication, and call administration. This training is expected to be a great opportunity for the members of CoEs to learn about the best practices in these areas and to improve their skills.

According to Getachew Adam (Ph.D., Research and Center of Excellence Director), the training will be conducted in a series of sessions, each focusing on a specific topic. The sessions will be led by experts in the respective fields, who will provide valuable insights and practical tips to the participants. The training is expected to be highly interactive, with ample opportunities for the participants to ask questions and share their experiences.

Getachew (Ph.D.) emphasized that the training is part of the Research and Center of Excellence Directorate's commitment to promoting excellence in research and innovation and support the members of CoEs to enhance their research capabilities and to contribute more effectively to the development of Ethiopia.

The training is expected to take place in the coming months, and the Research and Center of Excellence Directorate will officially announce and provide more details about the schedule and registration process soon. Stay tuned for more updates!



Getachew Adam (PhD, Research and Center of Excellence Director)



Call For Papers



SCIENCE, TECHNOLOGY & INNOVATION for INDUSTRY (STII 2024), May 16-17, 2024

Addis Ababa Science & Technology University (AASTU) is Organizing the 8th Annual International Research Conference entitled "Science, Technology & Innovation for Industry (STII 2024)" aiming at bringing researchers, technologists, innovators, governmental and industry stakeholders together to share their research experiences and results in science, technology and innovation for improved industrialization. Researchers and industry partners are invited to submit an abstract (maximum 300 words) of original research finding or the full paper (if ready) for oral presentation and/or posters.

Thematic Areas

Artificial Intelligence and Robotics:

- *Advancements in AI and Robotics, Ethical Considerations in AI and Robotics, Cutting-Edge Innovations in AI and Robotics, AI and Robotics in: Healthcare, Industry, Smart Cities, Education, Agriculture, Transportation, Finance, Space Exploration, Social Good, Disaster Response and Recovery, and Internet of Things.*

High-Performance Computing & Big-Data Analytics:

- *HPC and Cloud Computing, Agriculture Data Analytics, Climate Modeling and Weather Analytics, Cybersecurity Engineering, Computational Sciences, Healthcare Data Analytics, Business Analytics, Energy Data Analytics.*

Construction Quality and Technology:

- *Construction Materials, Green Design, Quality, Safety, Technology, and Sustainable Construction*

Nuclear Reactor Technology:

- *Nuclear Engineering, Reactor Technology and Nuclear Knowledge Managements*

Biotechnology and Bioprocess:

- *Industrial Microbes, Foods and Feeds, Biofuels, Bi-materials, Nanobiotechnology, Biochemicals, Bio-pharmaceuticals, Environmental Biotechnology, Molecular Biotechnology, Bioinformatics*

Nanotechnology:

- *Advanced (nano) materials, NT for water and environment, NT in medicine and pharmaceuticals, NT in food processing & packaging, NT in agriculture, NT in textile, NT in consumer industry.*

Sustainable Energy:

- *Wind, Solar, Hydropower, Geothermal, and Biomass energy, Energy efficiency and storage, Renewable energy as source for Vehicles, socio-economic development, and environment, Waste to Energy*

Mineral Exploration, Extraction, and Processing:

- *Mineral exploration, Mineral Extraction, Mineral Processing, Basic geoscience research: geochemistry, petrology, engineering Geology, hydrology, structural geology etc.*

Please submit your abstract/full paper online via: <http://4sciencehub.net>

Important Dates

- *Deadline for Abstract Submission: 10th March 2024*
- *Deadline for Full paper and Poster Submission: 25th March 2024*
- *Deadline for Registration : 15th April 20234*

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