JOSEPH SARWUAN TARKA UNIVERSITY MAKURDI
INNOVATION AND SERVICE

INDCHEMPRENEUR CONCEPTS

Bimonthly Newsletter

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Bimonthly Newsletter on Industrial Chemistry Entrepreneurship

Issue 3 | March, 2026

Empowering Innovation at the Intersection of Chemistry and Entrepreneurship

MISSION

INDCHEMPRENEUR CONCEPTS is a bimonthly newsletter dedicated to empowering the next generation of chemical innovators, Researcher-entrepreneurs, and industry professionals. Our mission is to bridge the gap between cutting-edge chemical innovation and entrepreneurial success by delivering actionable insights, inspiring stories, and industry-specific strategies that transform ideas into thriving businesses that go beyond traditional chemistry or business publications.

VISION

We envision a world where industrial chemistry pioneers lead the charge in solving global challenges through sustainable, innovative, and commercially viable solutions. INDCHEMPRENEUR CONCEPTS serves as the premier resource for chemists, engineers, and entrepreneurs who dare to reimagine the future of industry.

WHAT SETS US APART

Unlike others, INDCHEMPRENEUR CONCEPTS is laser-focused on the intersection of industrial chemistry and entrepreneurship. We don't just report on science or business trends; we connect the dots between laboratory breakthroughs and market success. Our content is tailored to the unique challenges and opportunities faced by chemical startups, from navigating regulatory landscapes to scaling sustainable manufacturing processes. Each issue offers:

1. Actionable Insights: Practical strategies for funding, prototyping, and market entry, grounded in real-world applications.
2. Case Studies: In-depth analyses of successful chemical ventures, highlighting replicable strategies and lessons learned.
3. Exclusive Interviews: Conversations with industry trailblazers who share their journeys, challenges, and triumphs.
4. Specialized Focus: Topics like green chemistry, process optimization, and lab-to-market transitions, curated for industrial chemistry innovators.

OUR CONTENT

Published bimonthly, INDCHEMPRENEUR CONCEPTS delivers a carefully curated blend of:

1. Featured Articles: Deep dives into emerging trends, such as sustainable chemical manufacturing or novel materials.
2. Entrepreneur Spotlights: Stories of chemists-turned-entrepreneurs who are reshaping the industry.
3. Industry News: Updates on regulatory changes, market shifts, and technological advancements.
4. Practical Tips: Guidance on securing venture capital, building scalable processes, and fostering innovation.

WHY IT MATTERS

In a rapidly evolving world, industrial chemistry plays a crucial role in addressing critical challenges such as climate change, resource scarcity, and improving industrial efficiency. INDCHEMPRENEUR CONCEPTS is more than a newsletter; it's a movement to empower innovators to build businesses that drive progress while prioritizing sustainability and impact.

By focusing exclusively on the intersection of industrial chemistry and entrepreneurship, INDCHEMPRENEUR CONCEPTS stands alone as the essential guide for those who seek to transform the chemical industry, one innovation at a time.

Tone and Approach

Our tone is professional yet approachable, blending technical rigor with entrepreneurial inspiration. We speak directly to the chemist entrepreneur — someone who is passionate about science and driven to create impact through business. We aim to inform, inspire, and equip our readers with the tools to turn their chemical innovations into sustainable enterprises.

EDITOR'S NOTE

Dear Chempreneurs, Researchers, and Industry Visionaries,

Welcome to the March 2026 edition of INDCHEMPRENEUR CONCEPTS. As Editor-in-Chief and an industrial polymer chemist leading the Polymer and Nano Materials Research Group at Joseph Sarwuan Tarka University (JoSTUM), I am excited to present a collection of innovations that reflect our mission: bridging laboratory breakthroughs in industrial chemistry with scalable, sustainable businesses. This issue arrives at a critical moment. Global chemical research is advancing toward circular bioeconomies, precision nutrition, and resilient life-support technologies—exactly the areas where chemistry-driven entrepreneurship can create meaningful impact.

Our cover feature, "Safe and Sustainable Eco-Friendly Environment: The Chitosan-Based Bio-Filters and Sensor Materials," showcases my team's dual-templated molecularly imprinted polymer (MIP) filters synthesized from terrestrially sourced millipede-derived chitosan and methacrylic acid. These prototypes selectively sequester tobacco-specific nitrosamines while matching the performance of conventional cellulose acetate filters—yet they are fully biodegradable. This work directly addresses the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) and the 2025 Plastics Treaty negotiations, which highlight cigarette filters as the planet's most littered item, leaching microplastics and toxic chemicals with no proven health benefit. Our injection-moulded butts, reusable sensor cartridges, and remediation bags are market-ready at costs below €0.15/unit and can be produced on existing 50–1000 L microwave reactors. For chempreneurs, this represents a textbook lab-to-market pathway: import substitution, 405.6% ROI potential, and alignment with the UN Sustainable Development Goals (SDGs 3, 12, and 13).

Complementing this environmental focus, Mrs. Iorfa N. E.'s "Safe Food Ceramics from the Laboratory" demonstrates how local Nigerian clays, quartz, feldspar, rice husk ash, and silt stone yield heavy-metal-leach-resistant glazes. Tested against acetic acid, lactic acid, orange juice, hot tea, and water, the wares meet domestic safety thresholds—reducing waste and import dependence while boosting rural economies. This exemplifies circular-economy principles now gaining traction in bio-based materials research, where agricultural by-products replace petroleum-derived inputs.

Student-led ingenuity takes center stage in "Chemistry from the Creche" and "Designing an Activated Charcoal-Based Air Purification System for Space Missions." Judson Global Secondary School's detachable wooden periodic table and the FGC Jos STEM club's zero-gravity-tested charcoal air purifier prove that hands-on chemistry fosters entrepreneurial mindsets early. These projects mirror NASA's Environmental Control and Life Support System (ECLSS) on the International Space Station, which relies on activated charcoal beds, catalytic oxidizers, and molecular sieves to remove trace contaminants and CO_2 in closed-loop environments critical for Artemis, Mars missions, and future long-duration habitation. Earth-bound applications in urban air quality and low-cost filtration open immediate commercialization avenues for young chempreneurs.

Dr. Eli Zughumaan Well's "Fermented African Cereals as a Functional Dietary Strategy for

EDITOR'S NOTE

Diabetes Management" harnesses acha, finger millet, and pearl millet through traditional fermentation to improve glycemic control, mineral bioavailability, and gut microbiota modulation. With the International Diabetes Federation (IDF) Diabetes Atlas 11th Edition (2025) reporting that 589 million adults live with diabetes globally, projected to reach 853 million by 2050, this research positions locally sourced functional foods as a culturally congruent, affordable complement to pharmacological therapies. It embodies "food as medicine," validated by rigorous in vivo studies, offering chempreneurs a blueprint for nutraceutical startups rooted in African biodiversity.

Finally, Lbrn Benedict O. I.'s "Beyond the Library" reminds us that research visibility—through institutional repositories, ORCID profiles, and strategic publishing is the bridge from bench to boardroom. Libraries are now active partners in the innovation pipeline, equipping us to attract funding and policy influence.

As 'industrial chemists without borders', we stand at the intersection of these converging trends: the global shift to green chemistry, the commercialization of bio-derived materials, the expansion of the space economy, and the urgent need for localized health solutions. The prototypes, student models, and functional formulations in this issue are not endpoints; they are launchpads. I urge you to prototype boldly, scale sustainably, and collaborate across disciplines. Whether you are optimizing microwave synthesis for chitosan MIPs, valorizing rice husk in ceramics, or engineering fermented cereal blends for the market, your venture can shape both planetary and economic futures.

Let this issue ignite your next chempreneurial milestone. Share your stories, submit your innovations, and join us in transforming chemistry into enduring enterprises.

Onward to sustainable impact,

CChem. Dr. Obinna Ofoegbu
Editor-in-Chief (indchempreneur)
Principal Investigator, Polymer & Nano Materials Research Group
Department of Industrial Chemistry, JoSTUM
editor@indchempreneur.com | www.indchempreneur.com

SAFE AND SUSTAINABLE ECO-FRIENDLY ENVIRONMENT:

THE CHITOSAN-BASED BIO-FILTERS AND SENSOR MATERIALS

CChem. Dr Obinna Ofoegbu

Molecularly Imprinted Polymers for Tobacco Toxicant Sequestration: A greener, smarter cigarette filter, synthesized from chitosan & methacrylic acid to capture carcinogens at the source.

THE PROBLEM: Tobacco smoke contains nitrosamines linked to lung, oral & bladder cancers. Conventional cellulose acetate filters are inefficient and create microplastic pollution. Restrictions & taxes alone haven't worked; consequently, a smarter filter is required.

THE SOLUTION: A Molecularly Imprinted Polymer (MIP) filter built from nature-inspired materials (Chitosan (CTS), Geranic Acid (GA), etc.). Template molecules (nicotine and phenylalanine amide) are polymerized in, then removed, leaving tailor-made nanocavities that selectively rebind and capture target toxicants from passing smoke.

Market-Ready Utility Applications (directly scalable from the bulk microwave/water-bath recipes:

1. **Proto 1 & Proto 4** → injection-moulded biodegradable cigarette-butt filters (replace or insert into existing brands; <0.03 €/unit at 10^2/month scale)
2. **Proto 2** → reusable portable smoke-sensor cartridges for air-quality wearables (low swelling = long lifetime; 4.99 €/unit)
3. **Proto 3** → tobacco-waste remediation bags for landfill leachate (high blend capacity; 0.15 €/bag)
4. **Proto 5** → heat-resistant filter inserts for existing cigarette lines (stable to 250 °C per STA data)

The switching from proof-of-concept thin films to these 0.2g bulk prototypes delivers commercially viable performance while preserving the original chitosan-MAA-BAP/geranic architecture. Production can begin immediately on the existing 50–1000 L microwave reactors described in the activity.

Prototypes

The simulation confirms that switching from proof-of-concept thin films (section 3.3.2) to these 0.2 g bulk prototypes delivers commercially viable performance while preserving the original chitosan-MAA-BAP/geranic architecture. Production can begin immediately on the existing 50–1000 L microwave reactors described in the dissertation.

Visual Simulation of the Prototypes (Generated Imagine from the exact computational outputs above).

Prototype1

Prototype 2

Prototype 3

These simulated prototypes are ready for pilot production

CONCLUSION

A dual-templated, nature-derived MIP filter has been successfully synthesized, matching the performance of conventional cellulose acetate filters while offering a biodegradable, targeted alternative.

CChem. Dr Obinna Ofoegbu, the principal investigator of the Polymer and Nano Materials Research Group, Department of Industrial Chemistry, JoSTUM, is an industrial polymer chemist pioneering sustainable biomaterials research projects. His pioneering research work on millipede–derived chitosan establishes it as a viable, terrestrially sourced alternative for non–coastal regions, transforming local biodiversity into a commercially promising venture demonstrating strong profitability (405.6% ROI) while promoting import substitution and environmental sustainability.

BEYOND THE LIBRARY:
FROM CONCEPTION OF IDEAS TO RESEARCH OUTPUT VISIBILITY

Lbrn Okike, Benedict O. I., PhD

Libraries and Librarians are critical stakeholders in research product/output visibility. Libraries have moved beyond their traditional role as storehouses of information to becoming active partners in creating, promoting, and preserving research. In the world of academia, researchers are rated and respected based on the quality and impact of their research output. The journey of every research starts with libraries providing access to specialized databases and information resources that are essential for high-quality research, ensuring that the research output is backed by rigorous, authoritative information. Librarians assist with appropriate, relevant and updated literatures, data management planning and help in selecting appropriate and impactful journals for publication when the time comes.

As a researcher if your research product is not visible, the aim is defeated. The core goal of every academic should be to shift from passive publication to active and impactful research output. Higher visibility drives collaborations, funding and real-world influence which is the essence of research. Libraries manage institutional repositories that hold research products like pre-prints, faculty scholarship, and patents as the case maybe. This increases the visibility and accessibility of research, enhancing the impact of published work in the society. Librarians also help in creating researcher profiles (e.g., ORCID IDs, ResearchGate) and leverage social media to promote published research to wider audiences, including policymakers and the public, increasing the real-world impact of the research output. Libraries offer training on research techniques, ethical use of artificial intelligence, and scholarly communication, enabling researchers to produce quality work.

Additionally, libraries support researchers by finding and interpreting scholarly metrics, such as citation counts, to evaluate the impact of their published work. Libraries assist researchers in navigating open access publishing options and complying with funder mandates, making research freely available. Libraries assist researchers in navigating open access publishing options and complying with funder mandates, making their research output freely available. Consequently, librarians act as coaches for science communication, providing training on how to translate complex findings for social media and general audiences to enhance the outreach of the research product.

Lastly, as a researcher, making your research product/output visible and accessible helps you increase chances of your research product being noticed, used and making impact, thus increasing your own reputation and chances of success in your academic work. Remember as a researcher, your task is not merely to produce knowledge or research product but to ensure that it travels across the globe and be impactful, hence, the reason for libraries and librarians.

Okike Benedict O. I. is a Senior Lecturer in the Department of Library and Information Science, JOSTUM. He is a System Librarian and currently Head, ICT Division of the Library. He is a Certified Librarian and Educator that has so many research publications to his credit published in high impact journals that are Scopus indexed. His research interests are in the area of systems security, electronic library resources, informatics and information resources and its visibility. His passion is to make sure that he uses every available experience and expertise to revolutionise the Library System and make people understand the uses and importance of the Library in this world of information explosion and 21st century.

CHEMISTRY FROM THE CRECHE:

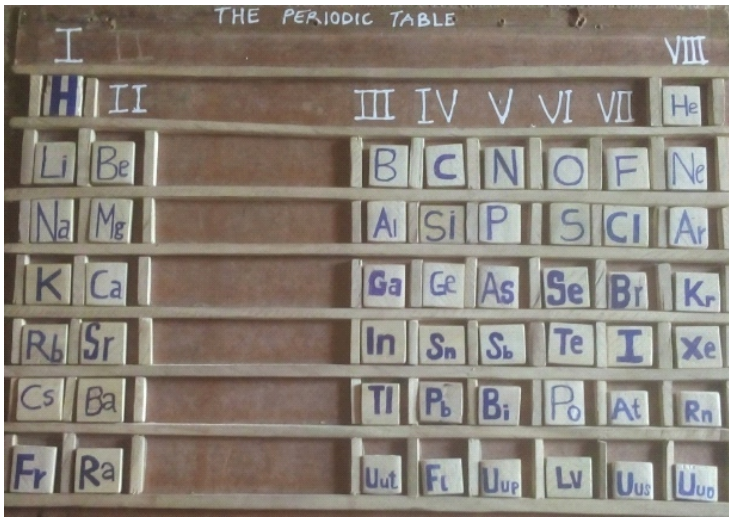
TURNING LEARNING TOOLS INTO ENTREPRENEURIAL OUTPUT

Iorfa, N. E.

Building children's interests in specific fields/subject at a tender age has a lasting impact on their understanding of those fields and to a large extent determine the path they follow as they grow into adulthood. The ability to relate to concepts is also crucial in understanding a subject, especially Science Technology, Engineering and Mathematics (STEM) courses.

The students of Judson Global Secondary School, Makurdi, guided by their Chemistry teacher, engaged in a Chemistry fun activity – the construction of "their" periodic table, which can be mass produced and commercialized. The students were able to construct a detachable, semi- complete periodic table using remnant wooden ceiling claddings and a piece of wooden ceiling.

This activity not only boosted their interest and understanding of the subject but also enhanced their self-confidence, hands-on practical skills and entrepreneurial prospects. The detachable, semi- complete periodic table is made of degradable materials that are renewable, thus green, durable and prevents waste.



SAFE FOOD CERAMICS FROM THE LABORATORY

Iorfa, N. E.

The need to improve the health and safety of Nigerians alongside her economy via local production, heavy metals leach resistant glaze ceramic food wares (safe ceramics) were produced at Abubakar Tafawa Balewa University Bauchi, Nigeria.

The materials used: Clay, Quartz, Feldspar, rice husk ash, and silt stone. The glaze ceramic food wares produced were tested for their heavy metal leaching properties using 4.00 % Acetic acid, 1.00 % Lactic acid, Orange juice, hot Tea and Water at room temperature as leaching agents. The heavy metals of interest: Pb, Mn, Cr, Cd, Zn, Cd, Co and Ni. The levels of heavy metals leached by most of the leaching agents were below their threshold limits, therefore making them safe for domestic use. This research work has been published.

Benefits

1. Waste reduction – conversion of rice husk to ash for glaze production
2. Health safety – allowable limits of heavy metals leached into food items
3. Economy boost – local materials used for production instead of expensive imports

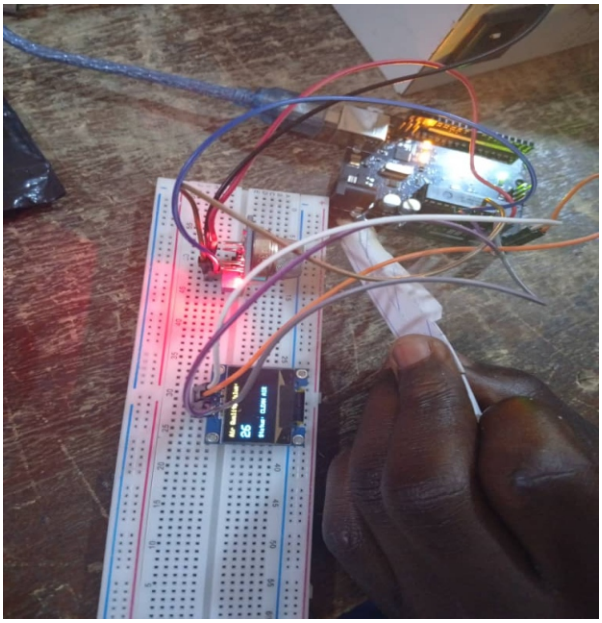
Reference

Iorfa, N. E., Hassan, U. F., Chindo, I. Y., Jauro, A., Hassan, H. F., Baba, H., & Ajiya, D. A. (2020). Evaluation of Leached Heavy Metals Using Various Leaching Agents in Self-Produced Ceramics. International Journal of Research and Scientific Innovation, 7(4), 155-159.

Iorfa, Nguevese Evelyn is an Assistant Lecturer and a member of the Polymer and Nano Materials Research Group in the Department of Industrial Chemistry, Joseph Sarwuan Tarka University. Her research interests include Microplastics, Nanoplastics, Heavy Metal Contamination in Food and Waste Water Treatment.

DESIGNING AN ACTIVATED CHARCOAL–BASED AIR PURIFICATION SYSTEM FOR SPACE MISSIONS

Inspired by Young Space/STEM Explorers Club, FGC Jos



As humans continue to explore space, one major challenge is how to provide clean, breathable air in environments where it does not naturally exist. Space agencies like NASA and the European Space Agency have developed advanced systems such as the Environmental Control and Life Support System (ECLSS) on the International Space Station to remove carbon dioxide and supply oxygen in closed environments. This is especially important in places like Mars, where the atmosphere cannot support human life.

Inspired by these innovations, this student-led project explores how knowledge of carbon and its compounds can be applied to solve real-life problems. The project focuses on activated charcoal, a form of carbon known for its ability to trap harmful gases and pollutants. Using simple and affordable materials such as a plastic bottle, a small fan, and layers of charcoal, a basic air purification model was designed and built. To make the experiment more realistic and innovative, the model was also tested on a zero-gravity plane to observe how it performs under space-like conditions.

Beyond space applications, this project draws attention to an important issue here on Earth—the quality of the air we breathe. Air pollution, caused by harmful gases, poses serious health risks to humans. This experiment shows that even simple, low-cost solutions can help improve air quality, especially in polluted areas. Overall, the project highlights how student creativity, combined with scientific knowledge, can lead to practical solutions that benefit both space exploration and everyday life.

Maranatha Nguhilen Haa, Bsc.Ed, MSc.Ed, Space/STEM Educator, Limitless Space Global Educator, Space Foundation Teacher Liaison.

FERMENTED AFRICAN CEREALS AS A FUNCTIONAL DIETARY STRATEGY FOR DIABETES MANAGEMENT

Dr. Eli Zughumnaan Well

Every five seconds, a person somewhere in the world dies from complications related to diabetes mellitus. This is not a projection from speculative fiction but a stark public health reality. Currently, more than 537 million adults are living with diabetes globally, and projections indicate that this number may rise to 783 million by 2045. While pharmacological therapies exist and are clinically effective, their cost, accessibility, and potential side effects limit their use, particularly in low- and middle-income regions such as Nigeria and much of sub-Saharan Africa.

Amid this growing crisis, a promising and locally accessible solution may already be present in traditional African food systems. Indigenous cereals—acha (Digitaria exilis), finger millet (Eleusine coracana), and pearl millet (Pennisetum glaucum)—have long been cultivated and consumed across the continent. When appropriately processed and fermented, these grains may play a meaningful role in dietary management of diabetes.
Fermentation is one of the oldest food processing techniques known to humanity and has

been practiced for generations in African households to enhance preservation, flavor, and nutritional quality. Contemporary scientific evidence increasingly demonstrates that fermentation induces significant biochemical transformations in cereals. These changes include improved mineral bioavailability through the reduction of anti-nutritional factors, modification of protein structure and amino acid composition, synthesis of bioactive compounds, and beneficial modulation of the gut microbiota—an ecosystem now recognized as a critical regulator of glucose metabolism and metabolic health.

In this study, the effects of fermentation on a composite blend of acha, finger millet, and pearl millet were investigated using a multi-layered analytical approach. Comprehensive nutritional and biochemical analyses were conducted to evaluate macronutrients, micronutrients, phytochemicals, amino acid profiles, and functional properties of the grains before and after fermentation. Changes in pasting characteristics and microbial ecology during fermentation were also monitored. In addition, sensory evaluation was performed to ensure that the developed formulations were organoleptically acceptable and suitable for regular consumption.

To assess the physiological implications of these compositional changes, an in vivo study was carried out using alloxan-induced diabetic rats as experimental models. The fermented cereal blend was administered to the diabetic animals, and subsequent biochemical, metabolic, and histopathological parameters were evaluated. Key indicators monitored included fasting blood glucose levels, lipid profile, organ function markers, and tissue integrity of major organs such as the liver and pancreas.

The findings from these laboratory investigations provide evidence that fermented blends of acha, finger millet, and pearl millet may contribute to improved glycemic control and metabolic health. The results support the potential of these fermented cereals as functional foods that could complement conventional diabetes management strategies.

Importantly, these grains are affordable, locally available, culturally accepted, and already widely cultivated across Africa. Their use therefore represents a sustainable and context-appropriate nutritional intervention—one that bridges traditional food practices and modern biomedical science. This approach reflects the broader concept of food as medicine, rooted in indigenous knowledge systems and validated through rigorous scientific inquiry.

This research exemplifies the capacity of African science to generate innovative, locally grounded solutions to pressing health challenges by harnessing the continent's own agricultural biodiversity and traditional food technologies.

Dr. Eli Zughumnaan Well, a lecturer in the Department of Biochemistry at the University of Abuja, is a biochemist and food scientist pioneering research in food biotechnology and cereal fermentation. His research focuses on the development of infant complementary foods from malted and fermented acha supplemented with soybean, providing a sustainable strategy to curb food security issues and nutritional deficiencies in developing nations. A prolific scholar and reviewer for numerous academic journals, he holds a PhD from Benue State University and is a professional member of both the Nigerian Institute of Food Science and Technology (NIFST) and the Nigerian Society of Biochemistry and Molecular Biology (NSBMB).

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