

Climate Change related Publications SDG (7)

Title	Synthesis and characterization of new bifunctional SnZrSi oxide catalysts for biodiesel production
Type	Research Article
Researchers (Red colour indicates MSA affiliated author)	Shaimaa M. Ibrahim and Ahmad Mustafa
Field of research	Alternative Fuels
Impact on SDG's	SDG No. 7 Ensure access to affordable, reliable, sustainable and modern energy for all
Abstract	A set of unprecedented (mesoporous SnO ₂ /ZrSiO ₄) solids has been synthesized via the ultrasound assisted co-precipitation path. The impact of silica dopant content (ranged between 0.05 and 0.4 mol%) on the characterization evolution of the sonicated ZrSnO ₄ interface and their biodiesel production efficiency were examined. Physio-chemical characteristics of the synthesized catalysts were analyzed by XRD, SEM-EDS, TEM, TGA-DTG, N ₂ adsorption-desorption analysis, NH ₃ -TPD, UV-Visible/ DR, and FTIR before and after pyridine adsorption. The obtained results revealed the formation of reconstructed rutile-SnO ₂ and zircon as new active phases by calcination at 500 C, good morphology with mesoporous structure, and significant increase in the SBET, pore volume, interesting optical behavior, and exhibited different acidic properties. The impacts of reaction temperature, silica dopant content, fatty acid type and calcination temperature on the biodiesel % were examined. The tertiary oxide catalysts were gainful for the biodiesel production. The optimum catalyst (0.2 % SiO ₂ /ZrSnO ₄) had the biggest number of both strong Brönsted and Lewis acid sites compared to the doped and undoped catalysts, so, its maximum yield at optimum conditions for esterification of palmitic acid reaction was 90.2 % and can be reused until the fifth run with giving excellent yield for biodiesel production. But, for the transesterification of soybean oil reaction with methanol was maxima at 88% for (0.4 % SiO ₂ /ZrSnO ₄) sample. The kinetic, mechanism studies and thermodynamic parameters were estimated. The important role of the doped silica molecules in the mechanism of the esterification process was emphasized by the computational chemistry study.
Published in (journal/Book Name)	Journal of Molecular Liquids (Scopus, top 10%, Q1)
Publisher	Elsevier
Year	2022
Link	https://www.sciencedirect.com/science/article/abs/pii/S0167732222003488



Climate Change related Publications SDG (12)

Title	INTEGRATION OF ENERGY SAVING WITH LEAN PRODUCTION IN A FOOD PROCESSING COMPANY
Type	Research Article
Researchers (Red colour indicates MSA affiliated author)	Sameh A. Salah and Ahmad Mustafa
Field of research	Cleaner Production
Impact on SDG's	SDG No. 12 Ensure sustainable consumption and production patterns
Abstract	<p>Increasing the energy efficiency has become a key concern in manufacturing companies due to the increased energy costs and the environmental impacts. More efficient energy saving can make the most economic contribution towards solving these problems in the short run. Companies' governments are striving to identify the most effective measures to improve energy efficiency in manufacturing processes. The specific energy consumption (SEC) is a key performance indicator used to measure the energy consumed per product. Therefore, an improvement of this value contributes to decouple of economic growth from related increase of energy consumption. This paper highlights the needs of manufacturing companies for integrating energy performance in production management. This work focuses on studying the impact of implementing lean production concepts on decreasing the SEC in a food processing organization. The reduction of SEC can be achieved by increasing the total efficiency of the production line. Implementing the lean production methodology by using energy management model achieves an increase in the production output. The lean production used to eliminate all kinds of waste in production, while using the same input resources such as raw material and energy. The main source of waste found on the production line is the defective product and time waste during changeover and manual process. The achieved results showed that the SEC improved by 15.1% by reducing the lean wastes in the production line. Implementation of lean methodology has a great impact on improving the energy saving by reducing the specific energy consumption in the organization. The SEC is a key performance indicator used to measure the efficiency of a production line or a machine in relation to its production. Energy management model is useful in identifying the area of improvement and the energy saving measure.</p>
Published in (journal/Book Name)	Journal of Machine Engineering
Publisher	Wroclaw Board of Scientific Technical Societies Federation NOT Piłsudskiego 74 St. 50-020 Wroclaw, POLAND
Year	2021
Link	http://jmacheng.not.pl/Integration-of-Energy-Saving-with-Lean-Production-in-a-Food-Processing-Company,142394,0,2.html



Climate Change related Publications SDG (7)

Title	Green synthesis of isopropyl palmitate using immobilized <i>Candida antarctica</i> lipase: Process optimization using response surface methodology
Type	Research Article
Researchers (Red colour indicates MSA affiliated author)	Ahmad Mustafa and Fumiya Niikura
Field of research	Cleaner Production
Impact on SDG's	SDG No. 7 Ensure access to affordable, reliable, sustainable and modern energy for all
Abstract	This work aims to produce isopropyl palmitate (IPP), a common emollient ester in a solvent-free system. An esterification reaction between isopropyl alcohol (IPA) and palmitic acid (PA) was performed in a closed batch reactor using immobilized <i>Candida antarctica</i> lipase as a biocatalyst. Reaction conditions were optimized using response surface methodology based on a five-level, three-variable composite design. The interactive effects of conditions on the IPP yield were investigated in the following ranges: IPA-to-PA molar ratio of 3:1–15:1, 1%–4% (w/w) Novozym 435, and 1%–10% (w/w) molecular sieves. The optimum conditions were IPA-to-PA molar ratio of 15:1, 4% w/w of Novozym 435, and 10% w/w of molecular sieves at 60°C and 150 RPM for 2.5 h. The maximum experimental and predicted conversion values were 90.00% and 90.92%, respectively. Moreover, Novozym 435 exhibited remarkable operational stability because it was used for 15 cycles without considerably losing its original activity. In studying the feasibility of the proposed method, a process flow diagram was suggested to perform the semicontinuous production of IPP in a solvent-free medium.
Published in (journal/Book Name)	Cleaner Engineering and Technology – Journal - 2022
Publisher	Elsevier
Year	2022
Link	https://www.sciencedirect.com/science/article/pii/S2666790822001215



Climate Change related Publications SDG (7)

Title	Assessment of Performance and Emissions Characteristics of Diesel Engine using Water Diesel Emulsion: A Review
Type	Review Article
Researchers (Red colour indicates MSA affiliated author)	A. Mostafa, Ahmad Mustafa, and I. Youssef, and M. Mourad
Field of research	Alternative Fuels
Impact on SDG's	SDG No. 7 Ensure access to affordable, reliable, sustainable and modern energy for all
Abstract	Finding sustainable alternative fuel to substitute fossil fuel is a study area of interest for most organizations and societies. Such alternative energy should keep the balance between emissions improvement and diesel engine performance. Water-diesel (W/D) emulsion fuel is considered as an auspicious alternative fuel that can improve diesel engine performance and lower harmful exhaust emissions. This review critically discusses the effect of the obtained blend on diesel engine performance and emission characteristics based on the available experimental findings in the literature. The review also highlights the concept of water-diesel emulsion fuel, surfactant, and hydrophilic-lipophilic balance value (HLB). The types of emulsion and micro-explosion phenomena were also discussed. According to the literature review, most of the researchers suggested a significant improvement of the environmental footprint when W/D is used to reduce particulate matter (PM) and nitrogen oxides (NOX). However, other studies criticize the increase in carbon monoxide (CO) and hydrocarbon (HC) emissions.
Published in (journal/Book Name)	EnvironmentAsia
Publisher	Thai Society of Higher Education Institutes on Environment
Year	2021
Link	https://tshe.org/main/ea-journal-content?id=2



Climate Change related Publications SDG (12)

Title	Bio- and oxo-degradable plastics: Insights on facts and challenges
Type	Review Article
Researchers (Red colour indicates MSA affiliated author)	Wael Abdelmoez, Islam Dahab, Esraa M. Ragab, Omnia A. Abdelsalam, and Ahmad Mustafa
Field of research	Alternative plastics
Impact on SDG's	SDG No. 12 Ensure sustainable consumption and production patterns
Abstract	The global accumulation of single-use plastic bags made from nonbiodegradable plastics is the most concerning environmental issue nowadays. The utilization of biodegradable materials is a choice to reduce the environmental impact resulting from the use of plastic products. The utilization of renewable resources to produce fully biodegradable plastics is among the technologies used to overcome petroleum plastic's negative impact. On the other hand, the utilization of oxo-biodegradable plastics where prodegradant additives are incorporated in conventional plastics to promote their degradation under certain conditions has recently received much attention. This review discusses the types and challenges that face the implementation of biodegradable plastics technology that uses renewable resources. This review also covers the debate addressed in the literature about the biodegradability fate of oxobiodegradable plastic in the air, compost, soil, landfill, and marine. A comparative study included the potential published literature in the last 10 years was performed. Based on the discussed evidence in this review, it can be concluded that all literature agrees that the addition of pro-oxidant/prodegradants can accelerate the degradation of oxo-plastics to small fragments. However, the complete biodegradation of oxo-plastics by microorganisms remains in doubt. On the other hand, biopolymers produced from natural resources seem to be the future direction for plastics manufacturing especially single-use plastic bags.
Published in (journal/Book Name)	Polymers for Advanced Technologies, Journal
Publisher	Wiley
Year	2021
Link	https://onlinelibrary.wiley.com/doi/full/10.1002/pat.5253



Climate Change related Publications SDG (3)

Title	Novel Preparation Technique of Hyperimmune Globulins against Bovine Coronavirus as Surrogate of Beta Coronavirus
Type	Short Communication
Researchers (Red colour indicates MSA affiliated author)	Maha Raafat Abd El Fadeel, Ahmad Mohammad Mohammad Allam, Mohamed Fekry Elkersh, and Ahmad Mustafa
Field of research	Veterinary Science
Impact on SDG's	SDG No. 3 Ensure healthy lives and promote well-being for all at all ages
Abstract	Consuming time and effort to prepare hyperimmune globulins using Freund's adjuvant is a sophisticated and harsh technique. In this work, a novel, safe, and rapid method was proposed using monolaurin as an immune-stimulating agent in hyperimmune globulins production against Bovine coronavirus (BCoV). The mentioned virus was used as a surrogate to family Betacoronavirus. Bovine coronavirus (Mabus strain) with titer log ₁₀ 5.8 tissue culture infective dose infectivity (TCID ₅₀)/ml was used in this experiment. The inactivation of the virus was done using 1% ascorbic acid for 24h. Monolaurin emulsion (10% w/v) of was prepared by sonication using tween 20 and water. The inactivated bovine coronavirus was added to the emulsion by 20% of the final volume. The immunoglobulins were prepared by inoculating the inactivated virus with the adjuvant in rabbits and evaluated on the Madin-Darby bovine kidney (MDBK) cell line by virus neutralization test (VNT). The effect of the adjuvant was assessed by histopathological examination of vital organs such as the kidney and liver. The antibody titer against the BCoV was reached its peak, log ₂ 10 ²⁴ TCID ₅₀ /ml, at the 3rd-week post-inoculation in the rabbits. The level of the globulin reached a high level and its peak (14.3g/dL) at the end of the experiment. No abnormalities were seen in the livers and kidneys of the negative control group of rabbits. Monolaurin showed a new level of safety and efficacy when used as an adjuvant during the preparation of the immunoglobulins against BCoV.
Published in (journal/Book Name)	International Journal of Veterinary Sciences
Publisher	USP
Year	2021
Link	http://www.ijvets.com/pdf-files/Volume-10-no-4-2021/340-343.pdf



Climate Change related Publications SDG (3)

Title	Efficacy and durability of bovine virus diarrhea (BVD) virus killed vaccine adjuvanted with monolaurin
Type	Research Article
Researchers (Red colour indicates MSA affiliated author)	Maha Raafat Abd El Fadeel, Eman M. Soliman, Ahmad Mohammad Allam, Mohamed F. ElKersh, Rehab Mahmoud Abd El-Baky, and Ahmad Mustafa
Field of research	Veterinary Science
Impact on SDG's	SDG No. 3 Ensure healthy lives and promote well-being for all at all ages
Abstract	The bovine virus diarrhea virus (BVDV) causes reproductive, enteric, and respiratory diseases. Vaccination is essential in increasing herd resistance to BVDV spread. The selection of an adjuvant is an important factor in the success of the vaccination process. Monolaurin or glycerol monolaurate is a safe compound with an immunomodulatory effect. This study aimed to evaluate the efficacy of monolaurin as a novel adjuvant. This was examined through the preparation of an inactivated BVDV (NADL strain) vaccine adjuvanted with different concentrations of monolaurin and compared with the registered available locally prepared polyvalent vaccine (Pneumo-4) containing BVD (NADL strain), BoHV-1 (Abou Hammad strain), BPI3 (strain 45), and BRSV (strain 375L), and adjuvanted with aluminium hydroxide gel. The inactivated BVDV vaccine was prepared using three concentrations, 0.5%, 1%, and 2%, from monolaurin as adjuvants. A potency test was performed on five groups of animals. The first group, which did not receive vaccination, served as a control group while three other groups were vaccinated using the prepared vaccines. The fifth group received the Pneumo-4 vaccine. Vaccination response was monitored by measuring viral neutralizing antibodies using enzyme-linked immunosorbent assay (ELISA). It was found that the BVD inactivated vaccine with 1% and 2% monolaurin elicited higher neutralizing antibodies that have longer-lasting effects (nine months) with no reaction at the injection site in comparison to the commercial vaccine adjuvanted by aluminum hydroxide gel.
Published in (journal/Book Name)	Plos ONE Journal
Publisher	PLOS
Year	2022
Link	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0269031

Climate Change related Publications SDG (7)



Climate Change related Publications SDG (12)

Title	Selective synthesis of alpha monoglycerides by a clean method: Techno-economic and environmental assessment
Type	Research Article
Researchers (Red colour indicates MSA affiliated author)	Ahmad Mustafa , Fumiya Niikura, Carlo Pastore, Hoda A. Allam , Omnia Bassam Hassan , Muhamad Mustafa, Abrar Inayat, Sameh A. Salah , Ahmed Abdel Salam, and Reham Mohsen ,
Field of research	Cleaner Production
Impact on SDG's	SDG No. 7 Ensure access to affordable, reliable, sustainable and modern energy for all
Abstract	This work proposes an alternative green and selective biocatalytic route for Glycerin Monostearate (α -monostearin) production. The conventional method of production uses an elevated temperature. Apart from the high energy consumption, such high temperatures darken the final product's color, lead to random reactions, and produce high orders of diglycerides and triglycerides instead of monoglycerides. The proposed production process was performed by esterifying stearic acid with glycerin in an organic medium using <i>Candida antarctica</i> lipase (Novozym 435) at a mild temperature. The reaction conditions were optimized using the response surface methodology (RSM): optimum conditions were a temperature of 60°C, glycerin to stearic acid molar ratio of 8:1, and Novozym 435 amount of 6% w/w. The solvent addition remarkably improved the α -monostearin yield to nearly 80% without the need for the energy-intensive distillation step. The conventional autocatalytic esterification (AUT) process was also performed to investigate the comparative monoglyceride yield, and it was found to be 22.5%. Proton nuclear magnetic resonance and gas-chromatography confirmed that α -monostearin could be produced with the highest purity using the proposed enzymatic method (ENZ). Economic and environmental analyses were also conducted for the proposed ENZ process, and the results were compared with those of the AUT process. The total capital investment of α -monostearin production, considering a projected capacity of 4950 t year ⁻¹ and 11% interest for the proposed ENZ process, was favorably 2.5 times lower than that of the AUT process, suggesting a promising investment opportunity. However, the total production costs showed unfavorable negative net present value (NPV) and return on investment (ROI) for the ENZ process and favorable positive NPV and ROI for the AUT process, indicating that the proposed venture is not profitable for α -monostearin production. However, the process can be profitable at improved operational stability of Novozym 435 up to 1 kg per 3-ton product. The carbon footprint was calculated on the basis of the given capacity and conditions of 50 and 656 t CO ₂ eq./year for the ENZ and AUT processes, respectively. The synthesis of α -monostearin using the proposed route can be considered a building block toward a cleaner large-scale production of α -monoglycerides.
Published in (journal/Book Name)	Sustainable Chemistry and Pharmacy Journal
Publisher	Elsevier
Year	2022
Link	https://www.sciencedirect.com/science/article/abs/pii/S2352554122000948



Climate Change related Publications SDG (12)

Title	Enzymatic technology offers a ‘green’ route to producing oleochemicals, with several companies already utilising the technology or on the verge of demonstration-scale production
Type	Article in Magazine
Researchers (Red colour indicates MSA affiliated author)	Ahmad Mustafa
Field of research	Cleaner Production
Impact on SDG's	SDG No. 12 Ensure sustainable consumption and production patterns
Abstract	Despite the potential advantages of enzymatic processing in manufacturing oleochemicals, the process has not yet broken through into mainstream production. Chemical processing is the well-established route for oleochemical production globally and has proven its technical and economic feasibility on a large scale. However, the main drawback of chemical processing is its high energy consumption. The temperature of esterification/transesterification reactions, for example, ranges from 180-200°C. Such high temperatures darken the intermediate products and produce many unwanted by-products, so that many downstream treatment process steps are needed. Due to this, chemical technology has a high capital investment cost compared to an enzymatic-based plant. Enzymatic technology uses a mild temperature of about 60°C and allows a selective mechanism, which reduces the need for downstream process steps. As a result, the capital investment cost is lower. However, an existing manufacturer who already has a well-established conventional chemical process that works highly efficiently may not wish to convert existing conventional units. Working with enzymes requires special equipment and a different industrial set-up. Enzymatic Stock technology is therefore more attractive for new start-ups at the design and decision stage as the plant-based process costs about two-and-half times less than the chemical route.
Published in (journal/Book Name)	Oils and Fats International Magazine
Publisher	OFI
Year	2022
Link	https://www.ofimagazine.com/issues/march-april-2022



Title	Lipase Catalyzed Reactions: A Promising Approach for Clean Synthesis of Oleochemicals
Type	Book Chapter
Researchers (Red colour indicates MSA affiliated author)	Ahmad Mustafa
Field of research	Cleaner Production
Impact on SDG's	SDG No. 12 Ensure sustainable consumption and production patterns
Abstract	Oleochemicals are chemicals derived from oils and fats. Several industrial processes, such as splitting, distillations, and fractionation, are carried out to convert oils and fats into basic oleochemicals such as fatty acids and glycerin. These fatty acids can be further esterified to produce value-added oleochemicals. Usually, the esterification reaction is carried out using chemical catalysts such as mineral acids. Such chemicals pose threats to the environment owing to their trace presence in effluents. Furthermore, the chemically catalyzed esterification reaction is an energy-intensive reaction that harms the environment. Recently lipase-catalyzed hydrolysis/esterification reaction has received much attention. Besides the biodegradability nature of lipases, they can catalyze the reaction at milder temperatures and produce no toxic by-products. The techno-economic assessment has proved the feasibility of enzyme technology compared to replace chemistry-based routes. This chapter focuses on oleochemicals' sustainable production through various processes. The processes include esterification, transesterification, and interesterification.
Published in (journal/Book Name)	Book_Sustainable Solutions for Environmental Pollution: Waste Management and Value-Added Products, Volume 1
Publisher	Wiley
Year	2021
Link	https://onlinelibrary.wiley.com/doi/abs/10.1002/9781119785439.ch11

