Meetings International

36th International Conference on

NANOMATERIALS AND NANOTECHNOLOGY

July 27-28, 2023 | Hamburg, Germany

Heat exchangers technology and applications in heat exchanger engineering

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Over the years, all parts of a commercial refrigerator, such as the compressor, heat exchangers, refrigerant, and packaging, have been improved considerably due to the extensive research and development efforts carried out by academia and industry. However, the achieved and anticipated improvement in conventional refrigeration technology are incremental since this technology is already nearing its fundamentals limit of energy efficiency is described is 'magnetic refrigeration' which is an evolving cooling technology. The word 'green' designates more than a colour. It is a way of life, one that is becoming more and more common throughout the world. An interesting topic on 'sustainable technologies for a greener world' details about what each technology is and how it achieves green goals. Recently, conventional chillers using absorption technology consume energy for hot water generator but absorption chillers carry no energy saving. With the aim of providing a single point solution for this dual purpose application, a product is launched but can provide simultaneous chilling and heating using its vapour absorption technology with 40% saving in heating energy. Using energy efficiency and managing customer energy use has become an integral and valuable exercise. The reason for this is green technology helps to sustain life on earth. This not only applies to humans but to plants, animals and the rest of the ecosystem. Energy prices and consumption will always be on an upward trajectory. In fact, energy costs have steadily risen over last decade and are expected to carry on doing so as consumption grows. Refrigerants such as hydrochloroflurocarbons (HCFCs) are present in the ground source heat pump (GSHP) systems and can pose a threat to the environment through being toxic, flammable or having a high global warming potential.

Keywords: Absorption cycles, environment, heat pumps, refrigeration cycles, thermodynamic.

Biography

Abdeen Mustafa Omer (BSc, MSc, PhD) is an Associate Researcher at Energy Research Institute (ERI). He obtained both his PhD degree in the Built Environment and Master of Philosophy degree in Renewable Energy Technologies from the University of Nottingham. He is qualified Mechanical Engineer with a proven track record within the water industry and renewable energy technologies. He has been graduated from University of El Menoufia, Egypt, BSc in Mechanical Engineering.

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Pros and cons of nanoparticles on health

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Nanoparticles (NPs) are tiny particles. According to the International Organization for Standardization, the size range of NPs is in the nanometer range (1-100 nm). They exhibit unique properties and are used in various fields including medicine, environmental science, electronics, and textiles. However, there is growing concern about their potential adverse effects on human health. This poster provides a review of the literature on the pros and cons of NPs on human health. It discusses their interactions with biological systems and their beneficial uses in disease diagnosis, antimicrobial action, and cancer treatment. NPs can also act as catalytic converters to reduce pollution from the environment. However, NPs can also have negative impacts on the human body such as being cytotoxic and genotoxic and affecting the reproductive system and sexual behavior. The poster also discusses routes of exposure and current regulations and guidelines for the safe use of NPs. It highlights the need for further research and the development of standardized toxicity testing methods to ensure safe use in various applications. Safe concentrations should also be considered in diagnosis and treatment. Overall, this poster aims to provide a comprehensive overview of the pros and cons of NPs on human health and to promote awareness and understanding of the potential risks and benefits associated with their use.

Biography

Born with a passion for science, I pursued my Bachelor's degree with a major in Chemistry. As I delved deeper into the subject, I realized that my true interest lay in interdisciplinary fields. With this in mind, I decided to pursue a Masters in Biophysics, which I am currently working on and will complete in June 2023. During my project work, I worked on the synthesis, characterization, and application of NPs in the biological field. I am currently preparing a research paper related to NPs.

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Spectroscopic investigation of metal oxide nanoparticles reduction mechanism in CLC process

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Transition metal oxide nanoparticles were used as oxygen carriers chemical looping combustion (CLC), a promising indirect combustion process that facilitates carbon capture. The focus of the investigation was to identify the reduction mechanism of the transition metal oxides during CLC using a continuous flow through system and spectroscopic, microscopic, and thermo gravimetric analysis. The comparison of the reactivity of copper (CuO), iron (α-Fe2O3) and cobalt (Co3O4) oxides with methane (CH4) in CLC reveals a link between the solid-state reduction mechanism of CLC oxygen carriers and their size-dependent reactivity toward CH4. The results show that the reactivity of CuO and Co3O4 are independent of the particle size, with reduction following the nucleation and nuclei growth (NNG) model, whereas α-Fe2O3 shows increased reactivity with decreasing particle size and reduction follows the unreacted shrinking core (USC) model. Supported by density functional theory (DFT) calculations comparing relative energies of formation for surface and bulk oxygen defects, we propose a conceptual framework for the size-dependence of metal oxide oxygen carriers for CLC. For oxygen carriers that reduce via the NNG model, where reduction initiates within the particle core, there will be no size dependence. For reduction via the USC model, where reduction initiates on the particle surface, reactivity will increase for smaller particles. These findings can guide development of metal oxide oxygen carriers for CLC by establishing trends in size-dependent behavior.

Biography

Dr. Hayder Alalwan has a PhD in chemical Engineering from the University of Iowa (2018) and he is currently the Chairman of Petrochemical Techniques department at the Middle Technical University -Iraq and he is the founder of this department. He has more than 34 publishing manuscripts in prestigious scientific journals and his H-index in Scopus is 17. His work focus on nanoparticles and their applications as adsorbents, catalysts, oxygen carriers, and other applications. His work is very relevant to environment with focusing on clean energy, minimizing pollutions and the treatment of water and wastewater.

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Photocatalytic degradation of food and juices dyes via photocatalytic nanomaterials synthesized through green synthetic route: A systematic review

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The most difficult problem of the present day is the scarcity of safe and sanitary food sources. Major risks to human health result from the excessive use of hazardous colorant moieties in the cosmetics and food industries. Research on strategies for removing these harmful dyes has received considerable interest in recent decades. The photocatalytic degradation of hazardous food colors is the primary subject of this review paper, which primarily focuses on the use of green-synthesized nanoparticles (NPs) for this purpose. Because of their negative impact on human health and the environment, synthetic dyes are increasingly becoming an issue of concern in the food sector. Photocatalytic degradation has evolved in recent years as an efficient and environmentally acceptable method for the complete removal of these dyes from wastewater. Green-synthesized NPs, such as metal and metal oxide NPs, are discussed in this review since they have been employed for photocatalytic degradation (without producing any secondary pollutant). It also describes the processes involved in making these NPs, the methods that were employed to evaluate them, and the photocatalytic activity they exhibit. The paper also investigates the mechanics behind the green-synthesized NPs' photocatalytic degradation of hazardous food colors. Also indicated are the several causes of photo degradation. The economic cost, along with the pros and cons, are briefly examined. The comprehensive nature of this review makes it useful for students of dyes' photo degradation. This assessment also includes discussion of some potential future developments and constraints. This review sheds light on the possibility of green-synthesized NPs as an alternative to conventional treatment methods for the elimination of harmful food dyes in wastewater.

Keywords: green synthesis; nanoparticles; dyes; photo degradation; degradation mechanism

Biography

Kashif Ali Khan is an MPhil research scholar at Department of Chemistry, QAU, Islamabad. Also serving as Lecturer in Chemistry at Government Degree College, Gandaf, Swabi. His research areas include electrochemical sensing, Photocatalytic Degradation, Green-synthesis, and adsorption studies. He aims at contributing to world by working with white coat scientific community on the problems that are plague to the society.

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Nano sized photocatalyst for sustainable environmental pollution management applications

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Titanium dioxide (TiO2) is one of the most attractive transition-metal oxides photocatalyst because of its superior physical and chemical properties, which has been widely applied in environmental clean-up (photocatalytic pollution removal) as well as antibacterial/antiviral coating applications. The performance of TiO2 in these applications highly depends on its structural, electronic, optical, and morphological as well as the surface properties (exposed facets). Great effort has been devoted to adjust these properties and apparent progress has been made on the synthesis of the 0-, 1-, 2-, and 3-dimensional nanostructured TiO2 materials. Today, the presentation will cover the synthesis of TiO2-based nanomaterials and their sustainable environmental pollution management applications. The morphology was studied using scanning electron microscopy (SEM) and elemental composition investigated using energy dispersive spectroscopy (EDS) showed peaks for Zn and O only. The exact size of ZnO particles and its crystalline nature were investigated from transmission electron microscopy (TEM),High resolution transmission electron microscopy (HRTEM) and selected area electron diffraction (SAED). The TEM showed the size range of the ZnO NPs to be ~ 10–15 nm at 400 °C, ~ 15–25 nm at 600 °C and ~ 25–30 at 800 °C which are in good agreement with the SEM observation. The band gap energy was calculated from UV diffuse reflectance spectra and found to be 3.42, 3.38 and 3.35 eV for 400, 600 and 800 °C respectively. The fourier transform infra-red spectroscopy (FTIR) spectra of leaf extract confirmed the presence of phyto constituents such as amines, amides, quinines and ketones in the leaf extract. The ZnO NPs calcined at 400 °C having higher band gap energy and smaller size was used for photocatalytic degradation. The studies showed the efficiency greater than 90% towards degradation of 20 ppm Congo red dye solution at 0.24 g/L ZnO NPs in 1 h at pH 9.

Biography

Dr. Lai [PhD, BEng(Hons) | PEng, PTech, CEng (UK), MIEM, MIMechE (UK)] is currently an associate professor in Nanotechnology & Catalysis Research Centre, University of Malaya. Lai's main research interests are in the areas of chemically modified metal oxide photocatalysts, functionalized nanomaterials/ nanocomposite and carbon graphene materials, especially apply in environmental pollution management and solar energy technology.

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Biocompatible FeAl2O4 nanoparticles: Synthesis, characterization, and amine functionalization for improved antibacterial properties

Swapnali Walake

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Hercynite (FeAl2O4) is an earth-abundant mineral with a cubic crystal structure and belongs to the normal spinel ferrites. The FeAl2O4 (FAO) possesses excellent optoelectronic properties like optical absorption, electrical conductivity, superior magnetic and thermal properties, etc. Despite all these excellent properties, less attention was given to their nanoscale synthesis and functionalization for subsequent use in various applications. Herein, we have developed a low-cost synthesis methodology of nanosized FAO using a sol-gel method with advanced physicochemical properties. The nitrate salts of Fe and Al were used as precursors, and along with this, the citric acid was utilized as a chelating agent cum fuel to achieve the phase of pure FAO nanoparticles (NPs). Furthermore, the superior colloidal dispersion stability of the FAO NPs was achieved and standardized via post-synthesis surface functionalization using amino-propyl-trimethoxy-silane (APTMS). All the developed materials were carefully characterized using various state of art characterization techniques for their structural, morphological, optical, magnetic, and thermal properties. Finally, the antimicrobial properties of FAO and FAO-APTMS NPs were investigated. The improved antimicrobial performance was noted after APTMS functionalization.

Biography

Mrs. Swapnali Walake is a Junior Research Fellow at Symbiosis Centre for Nanoscience and Nanotechnology, Lavale, Pune, Symbiosis International (Deemed) University. She is currently working on development of magnetic nanomaterials for biological applications.

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