Shri Madhwa Vadiraja Institute of Technology and Management

Vishwothama Nagar, Bantakal, Karnataka 574115

International Conference on Materials, Energy, Environment & Manufacturing Sciences

20th and 21st December 2024

Souvenir

SMVITM

MEEMS-2024

About SMVITM

Providing Value-added, Holistic Engineering Education:

SHRI MADHWA VADIRAJA INSTITUTE OF TECHNOLOGY & MANAGEMENT,

BANTAKAL, UDUPI

Founded in 2010 by H. H. Shri Vishwavallabha Theertha Swamiji of Shri Sode Vadiraja Mutt – one of the 700 plus years old Ashta Mutts associated with the world famous Shri Krishna temple of Udupi in Karnataka – Shri MadhwaVadiraja Institute of Technology & Management (SMVITM), situated at Bantakal in Udupi has carved a niche for itself in imparting quality engineering education in the coastal Karnataka region. Shri Swamiji started the institute with the sublime objective of providing quality higher education to the needy student community at affordable costs. The motto Engineering your Career and Character with Care well reflects the objectives and philosophy of the institute. Despite, being the youngest institute in the region, SMVITM has made remarkable strides in its journey towards excellence and has emerged as the most promising engineering institute with its well-qualified and motivated faculty, state-of-the-art infrastructure and distinguished learning-centric facilities.

At present, SMVITM, with a total student intake of 480 per year, offers Bachelor of Engineering (B.E.) courses in Civil Engineering, Computer Science & Engineering Electronics & Communication Engineering and Mechanical Engineering. SMVITM ensures that its students are well trained in existing engineering practices and acquainted with the latest industrial trends.

The campus is conveniently located at Bantakal, which is about 6 km off the stretch of NH 66 that connects the coastal cities of Mangaluru (Mangalore) and Udupi. The campus is just 18 km away from Manipal, one of the well-known educational hubs in South India and 12 km away from Udupi town. Udupi is well connected by road, rail and air to all the major cities across the country. The institute has well-furnished in-campus as well as off-campus hostels with all modern amenities, separately for boys and girls. The institute is affiliated to Visvesvaraya Technological University, Belagavi; approved by the All India Council for Technical Education, New Delhi and recognized by the Government of Karnataka. The institution is not accredited till now.

The accomplishments of SMVITM have already garnered well-deserved recognition and widespread praise from eminent personalities across the spectrum. Late Dr. A. P. J. Abdul Kalam, former President of India, having admired the vision and value addition to engineering education taking place at the institute, made a visit to the campus and appreciated the holistic education imparted at SMVITM and inspired the students in 2014. Shri A. S. Kiran Kumar, Chairman, ISRO; Dr. B. N. Suresh, Distinguished Scientist, ISRO; Justice Dr. M. Rama Jois and many more renowned scientists, technocrats and educationists have visited the institute to motivate and guide the students. Adding feather to its cap, SMVITM, was recently accredited by NAAC with A grade, which certifies the quality of education offered in the institute.

Vision

"To be recognized as an eminent center of education imparting holistic knowledge"

Mission

- Develop transformational leaders in technology, research, and innovation through integrated education to meet societal needs.
- Disseminate knowledge by providing a conducive academic ambiance at affordable costs.
- Nurture all-around personality development and impart value-based education founded on the tenets of humanity, integrity, ethics, and sustainability.

About MEEMS 2024

The International Conference on Materials, Energy, Environment & Manufacturing Sciences (MEEMS-2024) holds significant relevance in promoting sustainable practices, facilitating knowledge exchange, fostering collaborations and outreach activities. It focuses on various areas of Materials Engineering, technologies for harnessing energy sources and their utilization, environmental aspects and advances in manufacturing sciences. It emphasizes sustainable development and encourages multidisciplinary approaches to tackle challenges encountered in these areas. The conference offers networking opportunities, research dissemination and publication prospects in journals of international repute. Overall, the conference will play a crucial role in driving innovation and sustainability in Material, Energy, Environmental and Manufacturing Engineering, making it an important event for researchers and industry professionals. The conference will be held in hybrid mode, incorporating both virtual and in-person participation.

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Studies on the Microstructure and Hardness of Al 7075 During the Pre-Cold Rolled T6 Aging Treatment

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Abstract

Al 7075 is extensively used for transportation, military and aerospace equipment because of its good mechanical properties combined with light weight. In the present investigation, Al 7075 is subjected to cold rolling (20 and 40% roll deformation) and is subsequently artificially aged to study the influence of combined rolling deformation and aging on the microstructure and the hardness of alloy. The primary purpose of this work is to confirm the positive effect of pre-solutionizing rolling and subsequent aging on the microstructure changes and the corresponding hardness. It is observed that due to the pre-solutionizing rolling overall hardness of the alloy increases after successive aging. The higher the amount of cold rolling deformation the higher was the overall induced hardness. This is attributed to factors such as increased stored deformation energy, refinement of grain size and increased grain boundaries density. 40% roll deformation resulted 164 VHN as compared to non-rolled alloy hardness of 72 VHN. The optical microscope images showed equiaxial grains without blow holes or inclusions. Also, during the deformation there were no indication cracks or tear of ribs.

Evaluation of Tribological Properties of Aluminium-SiC-B4C Hybrid Composites

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Abstract

The majority of engineering applications with dynamic and thermal stress conditions use metallic materials. Various steel alloys have been used in industries for a long time because of their superior strength, durability, and thermal characteristics. However, certain of the technical applications demand materials with lower density, possessing adequate strength and thermal qualities. One such material is aluminum alloy, which has better corrosion resistance and a lower density than structural steels. The inclusion of ceramic elements with outstanding wear resistance qualities, such as SiC, Al2O3, TiC, B4C, etc., can further improve the tribological properties of aluminum. Based on the research work being carried out in the field of composite material an attempt is made to evaluate the changes in the tribological properties due to the hybrid reinforcement of material consisting of Al6061 as base alloy, SiC and B4C as reinforcement processed by stir casting method for 10% reinforcement with a combination of (2%SiC+8% B4C, 4%SiC+ 6% B4C, 6%SiC +4% B4C & 8%SiC +2% B4C). Tribological Test is being carried out with varying parameters of Load (10N to 60N), Sliding Distance (5000m) for a Constant Speed (2m/sec) for the processed materials.

Study on the Impact of Carburization and Alloying Elements on the Microstructural and Mechanical behaviour of low carbon Steels

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Abstract

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This study explores the impact of gas carburization on the microstructure, chemical composition, tensile behaviour, hardness, and impact strength of EN3, 20MnCr5, and EN353 steels. Specimens were carburized using a controlled process involving boosting, diffusion, and equalization phases, significantly increasing surface carbon content to form hard case layers with eutectoid composition while preserving a softer core. Microstructural analysis revealed distinct transformations: EN3 transitioned to coarse pearlite, 20MnCr5 developed fine carbide precipitates, and EN353 exhibited a bainitic matrix enriched with chromium and nickel. Tensile tests indicated strength enhancements across all carburized steels, with EN3 displaying moderate improvements despite grain coarsening, 20MnCr5 achieving partial yielding due to carbide formation, and EN353 demonstrating superior performance driven by the synergistic effects of chromium and nickel. Hardness analysis showed significant surface hardening, with deeper hardened zones in alloyed steels, while Charpy impact tests revealed reduced energy absorption after carburization, attributed to increased cementite and carbide induced brittleness. These findings underscore the importance of alloying elements and process parameters in tailoring mechanical properties, offering valuable insights into optimizing steels for industrial applications.

Mechanical Characterisation and Microstructural Analysis Comparison of Isothermal and Conventionally Annealed AISI 4140 Steel

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Abstract

Medium carbon steel is a very widely used material in the current scenario. They have a wide range of applications in machinery components, automotive parts and aerospace parts such as shafts, spindles, gears, axles, critical fasteners, landing gear structures and tool holders because of different alloying elements resulting in many variations in their properties. The research involves mechanical characterisation study of AISI 4140 medium carbon low alloy steel by annealing at constant temperature. AISI 4140 steels are subjected to conventional annealing also and compared with isothermal annealing heat treatment for material characterisation study is conducted with hardness and tensile strength. The microstructural analysis is carried out to validate the material properties using a scanning electron microscope. For conventional and isothermal annealed specimens, upto 30 % of reduction of tensile strength is observed. As for hardness, a huge reduction of upto 70 % is observed in the case of conventional and isothermal annealed specimens. Isothermal annealed specimens always showed better results in both characterisations due to a complete transformation of austenite to pearlite, and coarse to fine pearlite as analysed through microstructural studies. Conventionally annealed specimen shows lower hardness, tensile strength and impact resistance compared to isothermal condition.

Comparative investigation of mechanical characteristics of concrete by partial substitution of cement with Alccofine utilizing granite dust as fine aggregate.

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Abstract

This study presents a comparative investigation of the mechanical characteristics and quality of concrete by partially substituting cement with Alccofine, while utilizing granite dust as a fine aggregate. The primary objective is to evaluate the synergistic effects of these supplementary cementitious materials (SCMs) on concrete's compressive strength, tensile & flexural strength. Various concrete mixes were prepared by substituting 5%, 10%, and 15% of cement with Alccofine. Granite dust was employed as a replacement for natural sand to assess its impact on workability, density, and overall performance of the concrete.Comprehensive experimental tests were conducted, including compressive strength tests at 7 and 28 days compressive, tensile & flexural strength tests. The results indicate that the partial replacement of cement with these SCMs enhances the mechanical properties of concrete. Specifically, the combination of cement and Alccofine showed the most significant improvement in compressive, tensile and flexural strength, while fly ash contributed to improved workability and long-term strength gains. Furthermore, the use of granite dust as a fine aggregate demonstrated a positive effect on the concrete's density and mechanical performance, providing an eco-friendly alternative to natural sand. The study concludes that the optimal mix for achieving high-performance concrete involves a balanced combination of cement and Alccofine with granite dust as a fine aggregate, offering a sustainable approach to concrete production with enhanced mechanical properties.

Adsorption Studies of Phenol on Coal Combustion Residues

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Abstract

This study investigates the adsorption of phenol onto coal combustion residues (CCRs), focusing on the efficiency and mechanisms involved in the removal of phenol from aqueous solutions. CCRs, a byproduct of coal combustion, were characterized using various techniques such as X-ray diffraction (XRD), scanning electron microscopy (SEM), and surface area analysis to assess their suitability as adsorbents. The adsorption experiments were conducted at varying concentrations of phenol, pH values, contact times, and temperatures to evaluate the effect of these parameters on phenol removal. This study assessed the reusability of CCRs, showing potential for multiple adsorption-desorption cycles. Overall, the results highlight the potential of coal combustion residues as low-cost and effective adsorbents for the removal of phenol from contaminated water, offering a sustainable approach to utilizing industrial waste while mitigating environmental pollutants. Keywords: Adsorption, Phenol, Coal Combustion Residues and Adsorbent.

Design and Fabrication of Multi Grain De-husking and Cleaning Machine

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Abstract

This article focuses on the development of an efficient and versatile machine capable of dehusking and cleaning multiple types of grains simultaneously. The need for such a machine arises from the inadequacies of existing agricultural equipment, which often lack the ability to handle diverse grains efficiently. The primary objective is to design and fabricate a cost-effective, user-friendly, and adaptable solution to address these limitations. The methodology involves a systematic approach that integrates engineering principles, extensive research on grain characteristics, and iterative design iterations. Initial stages encompassed a comprehensive analysis of various grain types, their physical properties, and dehusking requirements. Subsequently, conceptual design phases were executed, integrating innovative mechanisms to ensure effective dehusking and cleaning while minimizing grain damage. The machine's fabrication phase involved precision engineering and material selection to ensure durability and operational longevity. The machine's adaptability to various grain sizes and types proved its versatility in agricultural contexts. In conclusion, the successful design and fabrication of this multigrain dehusking and cleaning machine signify a substantial advancement in agricultural technology. The machine's efficiency, adaptability, and cost-effectiveness offer promising prospects for farmers and agricultural industries, potentially revolutionizing grain processing practices.

Effect of different curing methods on the material properties of angular shaped artificial aggregates

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Abstract

Natural aggregates, which make up approximately three-quarters of the volume of concrete, are essential for construction and infrastructure development globally. However, over-exploitation of these materials has led to severe environmental and socio-economic impacts. Additionally, the improper disposal of industrial and agricultural by-products causes negative impacts on the environment, due to landfill pollution. The attempts to address the depletion of natural aggregates and provide value addition to such solid wastes have led to the production of geopolymer artificial aggregates (GPA). Initial explorations focused on synthesis using the pelletization technique limited to spherical-shaped artificial aggregates. This study aims to produce angular-shaped artificial aggregates and investigate their material properties when subjected to different curing methods. Industrial by-products such as Fly ash and Paper sludge ash were utilized as precursors, and alkali solutions such as sodium silicate and sodium hydroxide were used to manufacture GPA. Jaw crusher for angular-shaped aggregates, ambient and oven curing methods adopted in this experimental work. In addition, material properties, including specific gravity, loose bulk density, aggregate impact and crushing value and water absorption were investigated. Results showed that the manufactured aggregate's average specific gravity and loose bulk density were 1.8 and 880 kg/m3, fulfilling the requirement of lightweight artificial aggregates in EN13055. The average aggregate impact value of ambient curing and oven curing was 39% and 34%. The crushing value of ambient curing and oven curing was 34% and 30%, respectively. The oven-cured GPA exhibits more toughness and strength than the ambient-cured GPA for the same curing period. The study implies that the manufactured aggregates are suitable for construction, conserving natural aggregates.

Design and Development of an Optimized Heat Exchanger for Enhanced Thermal Management in Metal Hydride Systems Using ANSYS Simulation

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Abstract

This study investigates the optimization of heat exchangers used in metal hydride containers for hydrogen storage, with a focus on improving cooling efficiency and achieving faster thermal equilibrium. Using ANSYS simulation software, two heat exchanger designs were developed and evaluated by varying parameters such as coolant type, inlet velocity, and inlet temperature. The analysis assessed the impact of these variables on temperature distributions under different operational conditions. Results showed significant differences in performance, with water outperforming ethylene glycol as a coolant due to its faster cooling rate. The optimal configuration was achieved with water at a flow rate of 0.0009278 m/s and an inlet temperature of 288 K, where Design 1 demonstrated superior heat management capabilities compared to Design 2. These findings highlight the potential of Design 1 for efficient heat dissipation in hydrogen storage applications, offering valuable insights for the development of more effective cooling systems.

Characterization Of Corn Husk Fibers Reinforced Polymer Composites: A Review

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Abstract

Presently, research focuses on the study of Corn Husk Fibers (CHF) and their composite, also on the fiber drawing process and some of the properties such as chemical, physical, and mechanical, moreover concentrating on biodegradable natural fibers. Corn husk is a Natural fiber that has gained much scope and attention because of its abundant availability, low cost, and economical. Some of the significant properties are high strength, light density, environmentally friendly, nonabrasive, good mechanical properties and biodegradability. In this review, a detailed study of Corn husk fibers and composites and their various properties are encompassed, because of their environmental friendliness, biodegradability, and strength. Moreover, the impact of fibers on the physical and chemical, mechanical properties, and moisture absorption ability of composite materials have been also included. Natural fibers like corn husk fibers require chemical treatment so that their properties can be improved.

A Plant-Inspired Alternative to Conventional Memory System Design

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Abstract

In today's fast-paced tech world, the rising energy demand is a growing concern. Energy efficiency is critical in data centers, edge computing, and IoT (Internet of Things) devices. The fundamental memory systems used by modern gadgets, such as DRAM, Flash, or SSDs, are key contributors to the complex energy spectrum. Our paper taps into this very 'energy factor' by proposing a novel plant-inspired alternative to conventional memory technologies. Plant-based memory leverages the natural processes observed in plants, typically related to memory-like behaviors (e.g., the Venus flytrap), to create future memory frameworks. The paper reveals a prototype for the proposed idea. The developed memory design is energy-efficient and aligned with tomorrow's devices' sustainability and adaptability needs.

Investigation of the homogeneous charge compression ignition engine using a blend of Congress Grass Tamarind Shell Co-Pyrolysis Oil and compressed natural gas through experimentation and exergy

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Abstract

The performance, combustion, and emission behaviors of a direct injection (DI) compression ignition engine were investigated in this study using compressed natural gas (CNG) and Congress Grass Tamarind Shell Co-Pyrolysis Oil Blend (CGTSCPO20) port fuel injection (PFI) in the homogeneous charge compression ignition (HCCI) mode. The engine's behavior was examined in relation to various inlet charge temperatures. The engine's availability shares have been analyzed through exergy analysis. The inlet charge heating mode resulted in a decrease in hydrocarbon and carbon monoxide emissions and an increase in oxides of nitrogen. In the operation of the HCCI, the maximum exergy efficiency was observed to be 44.1% of CGTSCPO20 + CNG (350k). CNG and CGTSCPO20 are effective for engine operation in HCCI, as proved by the results of this study.

Durability Properties Of Concrete Using Marble Dust & Laterite Wastes

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Abstract

Concrete is the most versatile material, being rapidly using for the construction of various types of structures including pavement construction. These construction works creates demands for natural resources like fine aggregate and coarse aggregate. This results in a scarcity of these natural resources. In this context, there is a greater demand for the alternate materials which substitutes the use of natural aggregates. In the present study, Marble dust a waste material from the marble industry is used as a partial replacement for fine aggregate, and Laterite waste is used as a partial replacement for coarse aggregates. Both the materials are combined together and introduced at varying percentages and results are highlighted based on compressive test results. As per the results, 20 to 30 percent of both materials can be done effectively and also, concrete cube samples were cured in seawater to determine the durability aspect. Water absorption of the prepared mix samples are also examined. This research can draw the a conclusion that proper utilization of waste materials results in the production of eco-friendly concrete and a pollution-free environment.

Eco-Friendly Pavements Using Demolition Waste Material

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Abstract

Construction of rigid pavements have been increased in recent decades due to its advantages compared to flexible pavement but construction of rigid pavements demands for natural resources like river sand and bed of stone for coarse aggregate due to over exploitation, scarcity for these natural resources demands for alternate materials. In this research paper an attempt has been made to utilize demolition waste as a alternate for coarse aggregate. Demolition waste is partially replaced by varying percentages and results are tabulated based on compressive test result. Along with this Class C fly ash and natural coir fiber used an additives to improve compressive strength of concrete blocks. As a result upto 20% to 30% partial replacement can be done effectively.

Sustainable One-Pot Three Component Synthesis of [1,2,4]triazolo[1,5-a]pyrimidine Scaffolds in DBU-Water-Ethanol System

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Abstract

Multicomponent reactions (MCRs) are strategic tool for the development of intrinsic moiety or to synthesize organic scaffolds by the combination of three or more building blocks. Since they minimize the utilization of resources through one-pot reactions and maximize complexity of the molecules starting from simple substrates, MCRs are well accepted as sustainable transformations in synthetic organic chemistry. In the present work, synthetic protocol for [1,2,4]triazolo[1,5-a]pyrimidine scaffolds are described through one pot reaction of aromatic aldehydes, malononitrile and 3-amino-1,2,4-triazole. This three-component reaction was performed using DBU as an organocatalyst in ethanol-water (50:50) media. Furthermore efficient reusability of DBU-ethanol-water system up to three cycles made this as highly environmentally benign protocol.

EduLov – Personalized learning platform using AI and data analytics

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Abstract

The traditional learning methods are not able to satisfy the several contemporary educational requirements. The eternal purpose of EduLov project is to provide a learning backbone that reconciles these two contrasting paradigms. EduLov is the forward-moving, student-led platform catering to the one-of-a-kind education through digital tools. One such platform is EduLov which with the help of user specific profiles ensure the content and speed of learning can be customized on the basis of specific learners, thus ensuring a tailored learner journey. What makes this platform different is helping create virtual classrooms where students connect, communicate, cooperate, and access personalized resources that improve their understanding and retention. So, it pops in an assessment/quiz to track progress by incorporating real-time feedback and motivating students to do better. These are thick features backed with a strong backend to ensure that data flows seamlessly and keystrokes. EduLov's constant updating content also ensures that educators and learners never miss out on the latest resources and tools.

A Systematic Approach to Integrate Objects Using Single Learn Palette

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Abstract

In recent years, online learning has undergone substantial transformation, particularly within higher education, driven by the expanding accessibility of the internet. This study examines the growth of blended learning, which combines both online and face-to-face teaching methods. This approach now appears more effective and widely accepted than fully online courses, which initially gained popularity. Drawing on a blend of data—including student performance statistics and findings from existing research—this study illustrates how digital learning and interactive tools like Jamboard, Google Classroom, and digital recording blogs have become integral to today's educational experience, enhancing student engagement and accessibility. The findings reveal how these online platforms are challenging traditional educational methods and encouraging innovative teaching approaches. A distinctive aspect of this research is its focus on how educational institutions, instructors, and students are adapting to these changes, as well as the challenges they encounter during the shift to hybrid learning models. The results indicate that blended learning can increase student engagement and lead to improved learning outcomes compared to solely online or traditional methods, providing valuable insights into the role of digital technologies in enhancing education. Overall, this study highlights significant social benefits by offering educational institutions practical insights into preparing students for a technology-driven future while fostering more flexible and inclusive learning environments. This flexibility is particularly advantageous for students who benefit from adaptable learning options.