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DHANBAD

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Fuel Minerals and Metallurgical Engineering
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Prof Shravan Kumar

From HoD's Desk

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Dear Readers,

The eighth edition of our department's monthly newsletter begins with bidding farewell to the final year BTech and MTech students expressing their gratitude and achievement in their journey.

Our department's research and industrial collaborations (within and abroad) along with invited talks and seminars on emerging topics by the faculties of the department have also earned recognition for outstanding contributions by getting involved in developing lab showcasing the exceptional research output.

Adieu (Btech and Mtech students)

The department experience was good. Professors were helpful and classes were mostly clear. I enjoyed the labs and projects - **Divya Joshi**

I had a nice time in the department. The professors taught well and I learned a lot. Overall, a positive experience - **Ayush Kumar**

Student Feedback for the department:

It was a good learning experience. Most of the subjects were taught well and the environment was supportive - **Parimal**

The department has been helpful. I liked the teaching and the support from the professors - **Saurabh Shakti**

I learned many new things. The classes were mostly clear and the professors were approachable – **Devesh**

My time in the department was good. Some subjects were tough, but the support from professors helped - **Abhisek Tak**

The overall experience was nice. I liked the labs and the team projects. Professors were helpful - **Tharun**

I had a good experience in the department. The classes were regular and the environment was friendly - **Vaishnavi**

The department supported us well in academics. I liked the way many professors explained concepts clearly - **Himanjali**

My experience in the department was smooth. I enjoyed the learning process and got good support from professors - **Harshita Singh**

Prof. Vivek K. Sahu successfully organized a two-day seminar on **"Non-destructive testing, Powder metallurgy and Welding Technology"** in the FMME Department.

The event featured an engaging talk by **Mr. Manvendra Singh**, Scientist-E and Director at the Bureau of Indian Standards (BIS), who shared valuable insights on the latest BIS standardization techniques related to the seminar topics. The session was highly interactive, and the audience greatly benefited from the practical knowledge and in-depth discussions.

Prof. Vivek's journal publications:

1. F Zakir, A. K. Syed, X Zhang, A. E. Davis, **V. K. Sahu**, A. E. Caballero, R. Biswal, P. B. Prangnell, S. Williams; Microstructure tailoring of a wire-arc DED processed Ti6242 alloy for high damage tolerant performance; *Additive Manufacturing (2025)*.
DOI: https://doi.org/10.1016/j.addma.2025.104785

2. **V. K. Sahu**, S. Chandrakar, S. Jha, N. P. Gurao; Elucidating the fracture toughness of additively manufactured and thermo-mechanically treated Ti6Al4V; *Materials Transactions (2025)*
DOI: https://doi.org/10.2320/matertrans.MT-MC2024006

Development of Novel Porous UHMWPE for Efficient Passive Daytime Radiative Cooling

Surface and Coatings lab (FMME) led by **Prof. Kesavan Ravi** has recently published an innovative open-access paper in the journal *Next Materials*, showcasing a novel method for fabricating hierarchical porous Ultra-High Molecular Weight Polyethylene (UHMWPE) surfaces suitable for Passive Daytime Radiative Cooling (PDRC). The study demonstrates an effective way to achieve significant cooling without energy input, leveraging the intrinsic optical properties of the fabricated material.

The team discovered that while conventional UHMWPE structures exhibited modest cooling performance, introducing a novel two-step hybrid fabrication approach combining solvent treatment and thermal sintering significantly enhanced its performance. The resultant material exhibited a unique hierarchical micro-nano structure, consisting of micron-sized pores complemented by cabbage-leaf-like nanostructures. Remarkably, this hybrid UHMWPE surface achieved a solar reflectance of approximately 93%, yielding an impressive sub-ambient cooling performance of nearly 5°C.

The work was primarily done by 2 BTech internship students **Mr. Sujith Dunna and Ms. Borra Chandaswi**, PhD student **Mr. Gaurav Kumar** with the active collaboration from **Prof. Olivier Lame (INSA Lyon, France).**

Publication:

1. D. Sujith, Chandaswi Borra, Gaurav Kumar, Sarthak S. Singh, Olivier Lame, Kesavan Ravi, A simple solvent-based sintering method for fabricating hierarchal porous UHMW polyethylene structures for high solar reflectivity and sub-ambient cooling, Next Materials 8 (2025) 100673, **https://doi.org/10.1016/j.nxmate.2025.100673**

Lab Development

Prof. Pankaj K. Jain

Development of A Continuous Mineral Separator

Application number: 202531039656, 24 April 2025

The Continuous Mineral Concentrator is an innovative apparatus designed for the efficient separation of fine heavy and light particles, particularly those finer than 1mm, based on density differences in a continuous thin film gravity concentration process. This invention addresses limitations of existing batch-processing shaking tables like the Mozley Mineral Separator by enabling continuous operation. The technology currently stands at TRL 7 and has shown promising results in gold ore beneficiation.

The concentrator features a troughed Separation Table mounted on a Shaking Frame, which imparts horizontal reciprocating motion via an eccentrically linked disc driven by a motor. Dry solids are fed through a Vibrating Feeder into a Slurry Feeder, where water is added to form a high-concentration slurry, mixed consistently by an agitator. The slurry flows down the inclined table, where oscillatory motion stratifies particles by density—heavy particles settle at the bottom, and lighter ones rise to the top. Adjustable slits, controlled by knobs, allow precise separation of the stratified layers, with heavy particles discharged as underflow through the slits and light particles overflowing into tailings hoppers.

Key components include a control panel for regulating oscillation frequency, vibration intensity, agitator speed, and wash water flow, with a rotameter for flow rate monitoring. A Height Adjusting Handle allows slope adjustments to optimize processing for diverse materials. The apparatus is constructed with stainless steel for durability, offers high capacity, consumes less water, and provides operational flexibility compared to alternatives like the Wilfley table. Its robust, cost-effective design supports a wide range of feed characteristics, making it suitable for large-scale mineral processing, such as separating iron ore fines from impurities like alumina and silica, enhancing efficiency in mineral beneficiation.

Invited Talks

Prof. Kasturi Sala

Prof. Kasturi Sala was honored to be a part of the **INDIA CONCRETE CONGRESS CONFERENCE,** held on 17th April, 2025 at Biswa Bangla Exhibition Centre. Kolkata, Organized by Brand Image Integrated Solutions and Indian Institute of Metals (IIM), Kolkata in association with INDIAN CONCRETE INSTITUTE(Kolkata Centre).

As a distinguished expert in the field of construction industry, her insights and experience was highly valuable as a keynote speaker to share her knowledgeable thoughts with our esteemed audience for the conference. This conference also provided a platform to interact with industry members for dissemination of knowledge and networking.

Outreach Activities

Prof. Rajkumar Dishwar

Prof. Raj Kumar Dishwar, Assistant Professor in the Fuel, Mineral, and Metallurgy Department of IIT (ISM) Dhanbad, was invited as the guest speaker at **National Institute of Technology (NIT), Durgapur**. He further extended his discussion on extracting critical Minerals from the plant wastes for collaborations and projects in future.

EDITORIAL BODY

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