



Institute of Mining, Mineralogy and Metallurgy
Bangladesh Council of Scientific and Industrial Research
Ministry of Science and Technology
 Science Laboratory Road, Khanjanpur, Joypurhat-5900

Tel: +8802588877425, Fax: +8802588877426, E-mail: dir-immm@bcsir.gov.com
 Web Portal: immm.bcsir.gov.bd

Annual Report

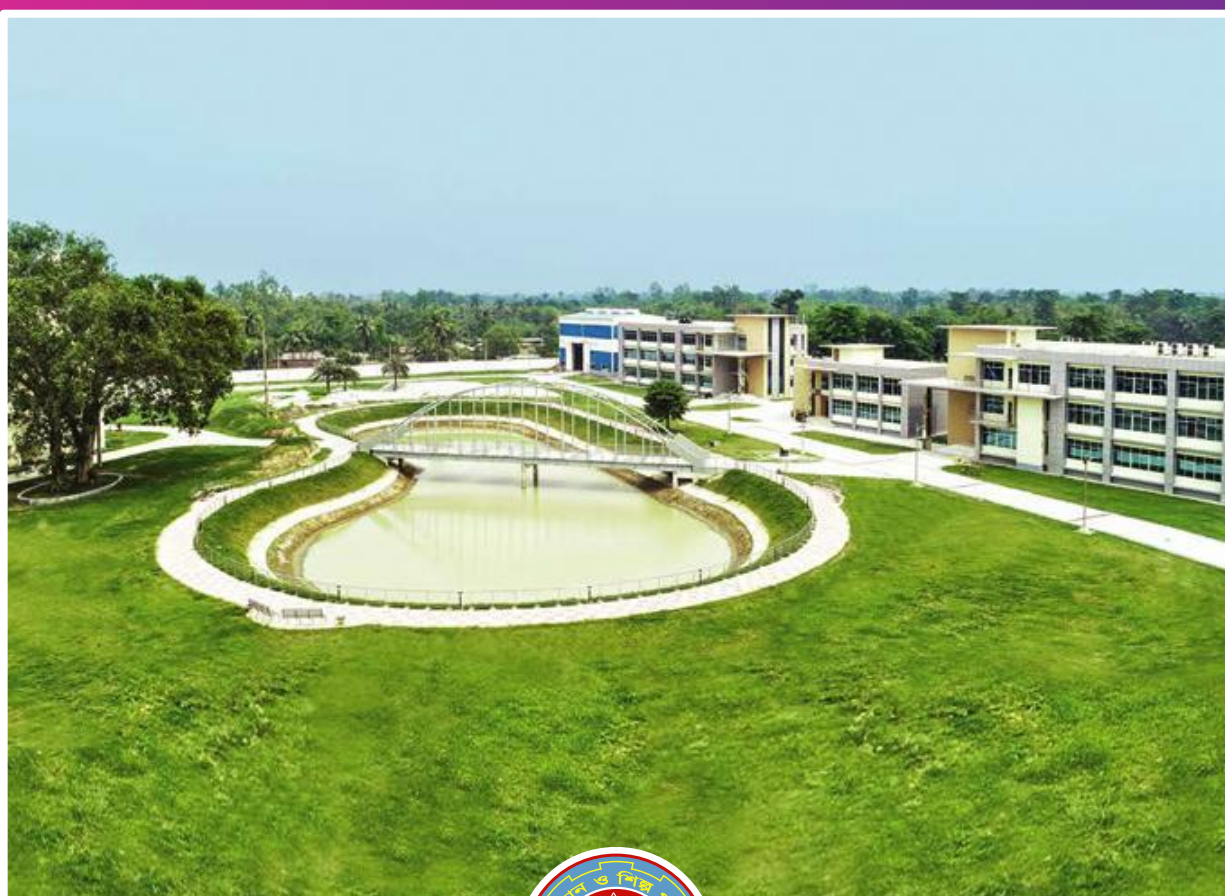
2021-2022



Institute of Mining, Mineralogy and Metallurgy
Bangladesh Council of Scientific and Industrial Research
Ministry of Science and Technology
 Science Laboratory Road, Khanjanpur, Joypurhat-5900

Annual Report

2021-2022



Institute of Mining, Mineralogy and Metallurgy
Bangladesh Council of Scientific and Industrial Research
Ministry of Science and Technology
Science Laboratory Road, Khanjanpur, Joypurhat-5900



EDITORIAL COMMITTEE

Convener:

Dr. Pradip Kumar Biswas
Principal Scientific Officer

Member:

Mohammad Sajjad Hossain
Senior Scientific Officer

Md. Sha Alam
Senior Scientific Officer

Syed Shafquat Mahmood
Scientific Officer

Published By:

Dr. Mohammad Nazim Zaman
Director-in-charge
IMMM, BCSIR, Joypurhat-5900

Message: Chairman, BCSIR



Institute of Mining Mineralogy and Metallurgy (IMMM), one of the prestigious entities of the Bangladesh Council of Scientific and Industrial Research (BCSIR) has completed its journey for the year 2021-2022. Consequently, it is a great contentment for me to know that IMMM is presenting its "Annual Report 2021-2022" when we are celebrating the golden jubilee of Bangladesh's independence and birth centenary of the greatest Bengali of a thousand years, Father of the Nation Bangabandhu Sheikh Mujibur Rahman.

IMMM is unique in its type in the country. It was established through the successful materialization of an annual development program (ADP) of the government and was formally inaugurated by the Honorable Prime Minister Sheikh Hasina, People's Republic of Bangladesh on 22nd January 2012. I extend my profound gratitude to our Honorable Prime Minister for all her support in establishing such a distinctive research institute. I also express sincere gratefulness to our Honorable Minister Architect Yeafesh Osman, Ministry of Science and Technology, People's Republic of Bangladesh for his enthusiastic support to run this institute smoothly.

The get-up-and-go of IMMM to accomplish praiseworthy tasks during the fiscal year 2021-2022 was undoubtedly extensive. Indeed, since its inception, the contribution of IMMM particularly in the pitch of research and development (R&D) has always been rated excellent. It must be mentioned here that to strengthen the R&D sector, IMMM has explored research activities with numerous prestigious international research institutions, such as CSIRO Melbourne (Australia), CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT) Bhubaneswar, Odisha (India), and RMIT University, Australia. Besides conducting regular R&D activities, this single-tracked research entity is also mandated to provide analytical services, and training programs and supervise research students of different universities for their higher degrees.

This Annual Report 2021-2022 is a summative document covering every single attempt accomplished by the scientists of IMMM over the period 2021-2022. I am confident that this report will satisfy you by providing ample information which is of relevance to the mining, mineralogy, and metallurgy sectors.

I thank the Director, Scientists, Engineers, and all workforces of IMMM who are, right through the year, associated with the championship ride of this unit. I especially thank the publication team for their contribution to bringing out this well-produced Annual Report. Last but not least, I sincerely hope that IMMM will continue its mission of stimulating and strengthening the R&D sector of BCSIR.

I wish its great success.

Joy Bangla, Joy Bangabandhu

A handwritten signature in black ink, appearing to read 'Aftab Ali Shaikh', with a stylized flourish at the end.

(Professor Dr. Md. Aftab Ali Shaikh)

Message from the Director, IMMM



I am delighted that the Institute of Mining, Mineralogy and Metallurgy (IMMM), BCSIR, Joypurhat is going to publish its annual report for the period 2021-2022. In the area of mining, mineralogy and metallurgy, this institute is unique. The report includes several activities of this tenure, such as research and development (R&D) activities, processes and patents, publications, student guidance and other efforts of the scientists and engineers.

It is my privilege to note that the annual report on the activities of IMMM for the period 2021-22 is ready for publication. The mission of IMMM is to carry out, promote and guide scientific, industrial and technological research using various raw materials, gangue and ore minerals for developing processes, patents and scientific publications that optimize the economic, environmental and social benefits for the people of Bangladesh. Different scientific conferences and training programs help enhance the knowledge and expertise of scientists. I believe that a concise presentation of all research activities in multidisciplinary research areas would be beneficial for industrialists and entrepreneurs.

I appreciate the editorial committee members who made this report a success. I express my heartiest thanks to the scientists, engineers and all other staff who put their best efforts into the nation through their relevant work.

Lastly, I express my gratitude to the Chairman of BCSIR for his encouragement in the preparation of this report.
Joy Bangla

A handwritten signature in black ink, appearing to read 'Dr. Mohammad Nazim Zaman', enclosed within a circular stamp or seal.

(Dr. Mohammad Nazim Zaman)
Director -in-charge,
IMMM, BCSIR, Joypurhat

CONTENT

Sl. No.	Title	Page No.
01	Introduction	06
02	Research and Development Activities	07
03	Mining Division	07
04	Mineralogy Division	07
05	Metallurgy Division	10
06	Achievement and Other Activities	10
07	Published Journal Articles	10
08	Published Conference Paper	11
09	Published Conference Abstracts	11
10	Published Book Chapter	11
11	Accepted Process	11
12	Field Work	12
13	Attended Training Courses	13
14	Sponsored R&D Project	13
15	Academic Research Guidance/ Supervision	14
16	Training Program	14
17	Seminar on R&D Activities	14
18	Meeting with Stakeholders/Workshops	14
19	BCSIR Scientific and Industrial Technology Fair	15
20	Analytical Problem Solved	16
21	ADP Project	16
22	Memorable Photographs	17
23	List of Most Important Instruments Used for Research and Analytical Services	18
24	Budget Allocation and Expenditure in 2020-2021	21
25	List of Directors worked in IMMM	21
26	Manpower	22

INTRODUCTION

The Institute of Mining Mineralogy and Metallurgy (IMMM) is one of the leading wings of the Bangladesh Council of Scientific and Industrial Research (BCSIR). It was established to grow up not only for the sustainable economy of Bangladesh but also for taking part in the journey of making Bangladesh a Developed Country. Though it is a multidisciplinary operating unit, its major research activities are related to containing Mining, Mineralogy, and Metallurgy fields. Previously, it was a development project of BCSIR starting in 2001 funded by the Ministry of Science and Technology and established in Joypurhat after having acquired about seven acres of land with other infrastructures from the Joypurhat limestone and cement factory project of Petrobangla. After the completion of the project in March 2009, the institute turned to a revenue budget with freshly appointed employees in June 2010. A total of Sixty One employees are working, out of which Twenty Three are scientists and engineers.

Honorable Prime Minister of the People's Republic of Bangladesh Sheikh Hasina inaugurated this institute on 22nd January 2012. The Honourable Prime Minister expressed her satisfaction with the R&D activities of IMMM and inspired the personnel to take modern instrument-based applied research projects to develop the science and technology innovation system of Bangladesh. She urged the scientists to expose their research findings to the nation and build up technological innovation using natural resources so that Bangladesh could reach a level of economy in the world.

IMMM is the only research organization in Bangladesh that conducts research in the field of mining, mineralogy, and metallurgy in Bangladesh. The following research, development, and innovation competencies exist within the unit (1) Mining Division (2) Mineralogy Division (3) Metallurgy Division.

The functions of the institute are as follows:

- * To conduct research on mining, mineralogy, and metallurgical fields to enhance the BCSIR activities.
- * To exploit the mineral deposits and carry out research on the innovation of commercial and exportable industrial products from the exploited mineral/ore deposits of the country.
- * To carry out advanced research and develop mineral processing systems from the promising minerals/ores.
- * To develop metallurgical processes and advanced technology for establishing various industries in the country i.e. agricultural tools, automobile parts, shipbuilding spare parts, composite manufacturing industry, etc.
- * To enhance the laboratories and research facilities within the field of mining, mineralogy, and metallurgy.
- * To provide training facilities for the development of manpower and upgrading the working knowledge of the workers of mining, mineralogy, and metallurgical industries.
- * To provide research facilities/higher studies to the Universities, government, and non-government organizations.
- * To provide technical assistance to the material processing metal industries.
- * To render analytical and testing services to the materials and metal product industries for their raw materials and finished products.

Mission: Conducting mining, mineral processing, and metallurgical research activities, process and technology development, promote industrialization and employment generation and thus achieving socio-economic development of the country and nation.

Vision: Utilization of Minerals and materials resources of the country in industrialization by indigenous technology.

RESEARCH AND DEVELOPMENT (R&D) ACTIVITIES MINING DIVISION

Mining is the extraction of valuable geological materials from the earth, usually from an ore body, vein, or coal seam. The mining division of IMMM is engaged in research work on mine planning and designing to develop minefields and solve mine-based industrial problems including support design, water management, subsidence, etc. This division has initiated advanced research and developed newer scientific solutions to the problems in the mining sector. Identification and characterization of mine products in order to make the best use of them in industrial sectors. This division is also engaged to help public and private organizations with different issues in the mining sector.

MINERALOGY DIVISION

Mineralogy is an earth science focused on the chemistry, crystal structure, and physical properties of minerals. The division has initiated advanced research in the field of mineralogy and developed new science and technologies to help local and export-oriented industries. The scientists (geologists, mineralogists, and chemists) of this division are engaged in the exploration of indigenous mineral resources, characterization, reserve estimation, and mineralogical and geological studies of the explored minerals and their industrial uses in order to substitute the imported raw materials used in the local industries.

Pilot plant study for separation of heavy mineral from the Padma River sand

Dr. Pradip Kumar Biswas, Md. Sha Alam, Md. Shams Shahriar, Md. Shohel Rana, Dr. Mohammad Nazim Zaman

Duration: July 2021- June 2023

Brief Description of the Project: Heavy minerals are usually defined as those with a specific gravity >2.9 . The majority of valuable heavy minerals, however, occur as oxides and include the economically important minerals rich in titanium, zirconium, and rare earth as well as the less valuable heavy minerals garnet, staurolite, and sillimanite, etc. Bangladesh is the largest delta of the world and the annual sediment load carried by numerous rivers are about 2.4 billion tonnes. Economic concentrations of heavy minerals are normally found in fluvial or beach environments (Biswas et al., 2018). Institute of Mining, Mineralogy and Metallurgy, BCSIR engaged with the exploration of valuable heavy mineral from different river sands of Bangladesh, especially the Brahmaputra river (Zaman et al., 2012). The Padma River is one of the largest sand bedded braided river of Bangladesh. In Bangladesh part its length is about 366km. The quantity of sediments carried by this river is 196-480 million tons/year (CBJET,1991; Hossain,1992) and the sediments contain large quantity of sandy materials. There have been many studies by researchers of various disciplines on various aspects but there is no study on mineral sands pilot plant study and flowsheet development for prospect and processing in the Padma river basin.



The objective of the project: The main objective of the proposed project are mentioned below

- ❑ Flow sheet development for separation of valuable heavy minerals into its component minerals from the Padma river sand.
- ❑ Separation of heavy minerals (zircon, rutile, ilmenite, garnet, monazite etc.) and light minerals (quartz, muscovite, biotite) from the Padma river sand.
- ❑ Process development for industrial uses.
- ❑ Mineralogical and geochemical characterization of the separated minerals.

Progress achieved: A manuscript is being prepared for submission to a reputed journal.

Preparation of SiO₂-TiO₂ based coating for construction materials

Md. Sha Alam , SSO., Md. Shams Shahriar, SO., Md. Shohel Rana, SO., Dr. Pradip Kumar Biswas, PSO and Dr. Mohammad Nazim Zaman, CSO

Among the different environmentally friendly technologies heterogeneous photocatalytic oxidation using TiO₂ has become an interesting technology due to its high photocatalytic and self-cleaning activities and has been used as a coating for various construction materials like metals, glasses, building surfaces, etc. Recently, the incorporation of TiO₂ (e.g., coatings or additives) into construction materials used in urban infrastructure, such as concrete and mortars, has been an interesting approach to reduce NO_x and VOCs (volatile organic compounds) at outdoor concentrations using sunlight as the only energy source; these are the so-called air purifying properties. However, its super-hydrophilic effect can easier remove the fouling substances on TiO₂-loaded surfaces, called self-cleaning ability.

Recent applications of photocatalytic building materials in urban pilot projects have demonstrated that maintaining the durability of the air-purifying and self-cleaning properties remains challenging, especially under outdoor conditions. Among other environmental factors, dust and oil accumulation have been reported as major factors affecting the properties of photocatalytic construction materials at an urban scale. In Bangladesh, available research information on the synthesis of photocatalytic coating for cement-based construction materials is still novel. However, recently this type of coating material is also being used in our country and market demand is increasing rapidly which is entirely fulfilled by importation at a higher cost. Therefore, the present R&D deals with the development of a SiO₂-TiO₂ coating in a cost-effective way that is applicable to cement-based construction materials, such as concrete and mortars.

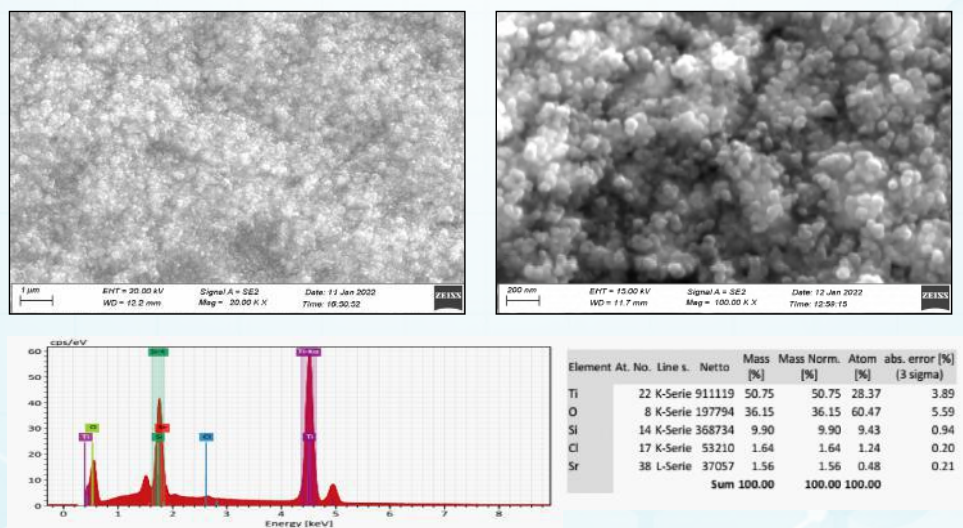


Figure: SEM microphotographs with EDS spectrum and elemental data of powder samples

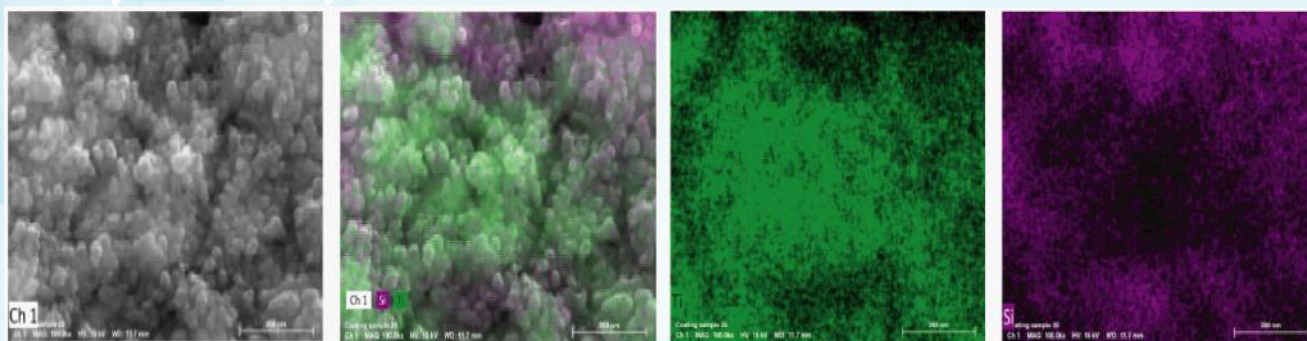


Figure: SEM microphotographs with EDS mapping showing the distribution of Si and Ti

Objectives: Development of a $\text{SiO}_2\text{-TiO}_2$ coating in a cost-effective way that is applicable for cement-based construction materials such as concrete and mortars.

Progress achieved: The project work is ongoing. $\text{SiO}_2\text{-TiO}_2$ coating materials have been synthesized with different proportions of Si & Ti raw materials. Several characterization works have been done and some are in progress. From this work, it is recommended that further up-gradation work should be done to improve the coating quality.

Characterization and beneficiation of Brahmaputra sand for foundry application

Md. Shohel Rana (PL), Md. Sha Alam, Dr. Pradip Kumar Biswas, Md. Shams Shahriar, Md. Imam
Sohel Hossain

Duration: July 2021 -June 2023

Brief Description: Though the river system of Bengal delta encompasses a huge amount of fluvial sand, no comprehensive studies are available on foundry sand in Bangladesh. The present research deals with the foundry properties of locally available river sand samples collected from Brahmaputra River, Chilmari, Kurigram, Bangladesh. To furnish the foundry properties of the river sand, a variety of laboratory analyses have been done in accordance with the various established methods and also Indian Standard 1918 (1966). The AFS Grain Fineness Number (GFN) ranges from 64-79 and the average size of sand is from 211.67-241.95 μm , which gives a good surface finish when making molds. The uniformity coefficient (Cu) and coefficient of curvature (Cc) lie between 1.93-2.42 and 1.05-1.15 respectively. The sand contains mainly quartz with small amounts of feldspar, amphibole, chlorite, and mica; and exhibits subangular to subrounded shape. Chemically the sand is dominated by SiO_2 (67.81-69.97%) and lesser amounts of other oxides. The TG-DSC analysis indicates that the Brahmaputra River sand possesses low thermal expansion nature, and it is thermally stable within 1000°C temperature and thus, it is suitable for non-ferrous metal casting (e.g., aluminum) within this temperature range. The result of strength properties along with compactability, green hardness, flowability, air permeability, bulk density, shatter index and loss-on-ignition of sand are sufficient to foundry molds preparation for non-ferrous metal casting (e.g., aluminum) without distortion or collapse even after the pattern has been removed from the molding box. Finally, it can be concluded that the country's foundry industry will be benefitted from the results of this study.

Objectives:

- To characterize the foundry properties of locally available Brahmaputra sands, Bangladesh
- To upgrade the sands by physical processing, i.e., to meet the foundry specification
- To determine the suitability of processed sands for foundry application

Progress achieved: The project is on-going. One journal article is accepted for publication in Archives of Foundry Engineering. Also one abstract is published in International Conferences on Environmental Protection for Sustainable Development (ICEPSD-2022) at Dhaka, Bangladesh.

METALLURGY DIVISION

Metallurgy is a domain of materials science that studies the physical and chemical behavior of metallic elements, their inter-metallic compounds, and their mixtures. The metallurgy division is engaged in research work on the development of efficient methods of materials processing and production to ensure the proper utilization of the various minerals/metals/ores found in Bangladesh. Researchers of this division conduct extensive research in the area of materials processing, extractive metallurgy, foundry technology, power metallurgy, composite material, and advanced ceramic engineering to meet the modern technological demand for advanced materials and to introduce newer methods to the industrial sectors, solve various metallurgical problems of the local metallurgical industries.

ACHIEVEMENTS AND OTHER ACTIVITIES

PUBLISHED JOURNAL ARTICLES:

1. Mst. Shanjida Sultana, Aninda Nafis Ahmed. Study on Sugarcane Bagasse Ash-Clay Mixture Properties to Develop Red Ceramic Materials. Sugar Tech. <https://doi.org/10.1007/s12355-022-01109-3> (2022)
2. Hasan, A.M., Hossain, I., Rahman, M.A., Pownceby, M.I., Biswas, P.K. and Zaman, M.N., 2022. Signature of Himalayan orogenic features in Brahmaputra River sediments, Bangladesh: Evidence from single-grain heavy mineral chemistry. *Geochemistry*, p.125897.
3. Hasan, A.M., Hossain, I., Rahman, M.A., Zaman, M.N., Biswas, P.K. and Alam, M.S., 2022. Chemistry and mineralogy of Zr-and Ti-rich minerals sourced from Cox's Bazar beach placer deposits, Bangladesh: Implication of resources processing and evaluation. *Ore Geology Reviews*, 141, p.104687. DOI: 10.1016/j.oregeorev.2021.104687
4. M. Sultana, A. Siddika, S. S. Mahmood, A. Sharmin, S. Tabassum, M. Rahaman, and M. S. Bashar, "Fabrication of Cu₂ZnSnS₄ (CZTS) thin films by ultrasonic spray pyrolysis at a low substrate temperature and effect of tin concentration on the characteristics of the CZTS thin films", *Bangladesh Journal of Scientific and Industrial Research*, V 57(1), Pp 1-6, 2022. DOI: <https://doi.org/10.3229/bjsir.v57i1.58894>
5. Mohammad Sajjad Hossain, Md Moazzem Hossain, "Structural, mechanical, thermodynamic, electronic and optical characteristics of LaPtBi half-Heusler compound from first principles analyses", *Ferroelectrics*, Vol. 585, Issue 1 (2021).
6. Nazia Khatun, Mohammad Sajjad Hossain, Most Hosney Ara Begum, Suravi Islam, Nazmul Islam Tanvir, Riyadh Hossen Bhuiyan, Md Al-Mamun, Effect of sintering temperature on structural, magnetic, dielectric and optical properties of Ni-Mn-Zn ferrites, *Journal of Advanced Dielectrics*, Vol. 11, No. 6, 2150028 (2021).
7. Islam, M. K., Somerville, M., Pownceby, M. I., Tardio, J., Haque, N., and Bhargava, S. (2021). Phase Equilibria Study of CaO-Al₂O₃-SiO₂-Na₂O Slags for Smelting Waste Printed Circuit Boards. *JOM*, 73(6), 1889-1898
8. Islam, M. K., Haque, N., Somerville, M., Pownceby, M. I., Bhargava, S., & Tardio, J. (2022). Estimation of the generation and value recovery from e-waste printed circuit boards: Bangladesh case study. In *REWAS 2022: Developing Tomorrow's Technical Cycles (Volume I)* (pp. 91-102). Cham: Springer International Publishing
9. Islam, M. K., Pownceby, M. I., Somerville, M., Tardio, J., Haque, N., & Bhargava, S. (2022). Effect of B₂O₃ on the Liquidus Temperature and Phase Equilibria in the CaO-Al₂O₃-SiO₂-

B₂O₃ Slag System, Relevant to the Smelting of E-waste. Journal of Sustainable Metallurgy, 8:1590-1605.

10. Rahman, M., Das, R. S., Khan, M. S. I., Hossain, M. I. S., Faruque, M. E., Khan, N. S., & Siddique, M. A. M. (2022). Textural characteristics of surficial sediments along the Noakhali coast, Bangladesh: An implication for mineral placer deposits exploration. Regional Studies in Marine Science, 52, 102304. <https://doi.org/10.1016/J.RSMA.2022.102304>
11. Rahman, M., Khan, M. S. I., Hossain, M. S., Hossain, M. I. S., Hasan, M., Hamli, H., & Mustafa, M. G. (2022). Groundwater Contamination and Health Risk Evaluation of Naturally Occurring Potential Toxic Metals of Hatiya Island, Bangladesh. Journal of Ecological Engineering, 23(6), 223-236. <https://doi.org/10.12911/22998993/148192>
12. Rahman, M., Saima, J., Rima, S. A., Hossain, M. I. S., Das, D. K., Bakar, M. A., & Siddique, M. A. M. (2022). Ecological risks of heavy metals on surficial sediment of Nijhum Dweep (Island), an important biodiversity area of Bangladesh. Marine Pollution Bulletin, 179 (April), 113688. <https://doi.org/10.1016/j.marpolbul.2022.113688>
13. Hasan, M., Rahman, M., Islam, M. A., Hossain, M. I. S., Kanak, K., & Azam, O. R. (2022). Assessment of Toxic Heavy Metals in Surface Water of the Meghna River Estuary: An Integrated Statistical Approach. The Dhaka University Journal of Earth and Environmental Sciences, June, 143-155. <https://doi.org/10.3329/dujees.v10i3.59080>

PUBLISHED CONFERENCE PAPER:

1. Ayesha Siddika, Munira Sultana, Syed Shafquat Mahmood, M. S. Bashar, Samia Tabassum, "The consequence of thickness variation and post annealing ambience modification on multilayered ZnO thin film coating", 3rd International Conference on Energy and Power, ICEP2021, AIP Conference Proceedings 2681, 020073, Pp 1-8. DOI: <https://doi.org/10.1073/5.0117741>

PUBLISHED CONFERENCE ABSTRACT:

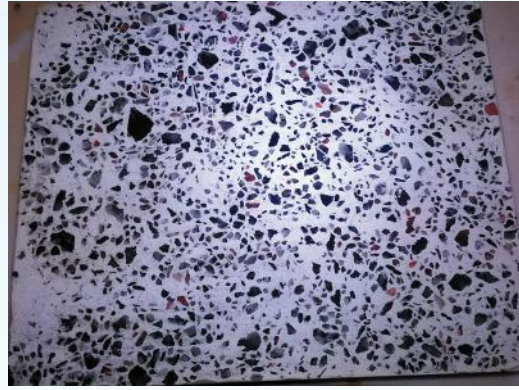
1. Biswas, P.K., Alam, M.S., Ahmed, S.S., Zaman, M.N., Pownceby, M.I., Nawshad Haque, N. and Alam, M.S. 2021. Prospects of mineral resources of the Tista River sand deposits in Bangladesh: A Techno-economic analysis, National seminar on Geoscience for sustainable development of Bangladesh, 15th December 2021.
2. Zaman, M.N., Biswas, P.K., Alam, M.S., Rana, M.S. and Shahriar, M.S. 2021. Pilot plant study for separation of heavy minerals of the Brahmaputra River sand, Bangladesh, National seminar on Geoscience for sustainable development of Bangladesh, 15th December 2021.

PUBLISHED BOOK CHAPTERS:

1. Shuronjit K. Sarker, Shanjida Sultana, Nawshad Haque, Anthony E. Hughes, Warren Bruckard, Biplob K. Pramanik, 2022. 'Rare earth elements recovery from secondary sources' In: Environmental Technologies to Treat Rare Earth Elements Pollution: Principles and Engineering by Arindam Sinharoy and Piet N. L. Lens (Eds.).2022. IWA Publishing, UK ISBN: 9781789062229 (Paperback) ISBN: 9781789062236 (eBook) Doi: https://doi.org/10.2166/9781789062236_0117
2. Zaman, M.N., Biswas, P.K., Rahman, M.A., Hasan, A.M. and Akon, E., 2022. River-borne sediments of Bangladesh and their economic importance. In Bangladesh Geosciences and Resources Potential (pp. 437-465). CRC Press.

ACCEPTED PROCESS:

1. Mst. Shanjida Sultana, Dr. Mohammad Nazim Zaman, Pradip Kumar Biswas, Md. Aminur Rahman "Development of artificial granite rock block using Maddhapara hard rock dust" (Ref no. 39.02.0000.043.37.792.20/65 Date: 16.11.2021).



Artificial granite rock block

FIELD WORKS:

1. Md. Imam Shohel Hossain, SO, Accomplished the field work at Barapukuria Coal Mining Area, Phulbari, Dinajpur under the research and development project '3D subsurface model generation in Barapukuria coal mine area.'
2. Completed field work under a R&D project (Characterization of Madhupur and Barind clay to infer its potentiality for local ceramic industries) at Sapahar, Naogaon.



Field work at Sapahar, Naogaon.



Field work at Barapukuria Coal Mining Area.



Field work at Barapukuria Coal Mining Area.



Field work at Sapahar, Naogaon.

ATTENDED IN TRAINING COURSE:

1. Mst. Shanjida Sultana, SSO, attended training on "TG/DTA & TMA" at PP &PDC, BCSIR, Dhaka from 5-9 December, 2021.
2. Mst. Shanjida Sultana, SSO, attended training on "E-governance and Innovation action plan" at, BCSIR, Dhaka from 30 November, 2021.
3. Dr. Pradip Kumar Biswas, PSO, participated in training on '40th BAB Understanding Training Course on ISO/IEC 17025:2017' held from 21-23 June, 2022 at BAB, Dhaka.
4. Md. Sha Alam, SSO, participated in "E-governance and Innovation action plan" at BCSIR, Dhaka held on 20 June 2022
5. Md. Sha Alam, SSO, participated in Training on "40th Understanding Training Course on ISO/IEC 17025:2017" at Bangladesh Accreditation Board (BAB), Dhaka held from 21-23 June 2022
6. Md. Sha Alam, SSO, participated in In-house Training on "UV-Vis-NIR Spectroscopy" at Institute of Fuel Research and Development (IFRD) held from 12-16 September, 2021
7. Md. Sha Alam, SSO, participated in In-house Training on Raman Spectroscopy" at Central Analytical and Research Facilities (CARF), BCSIR, Dhaka held from 31 Oct-4 Nov 2021
8. Md. Sha Alam, SSO, participated in "E-governance and Innovation action plan" at BCSIR, Dhaka held on 30 November 2021
9. Syed Shafqat Mahmood, SSO, Participated in In-House training on BET Sorptometer, held on 7-11 November, 2021 at Central Analytical and Research Facility (CARF), BCSIR
10. Mohammad Sajjad Hossain, SSO, Attended training program on "Operation and Maintenance of UV-Vis-NIR Spectroscopy", held at Institute of Fuel Research and Development (IFRD), BCSIR, from 12-16 September 2021.
11. Mohammad Sajjad Hossain, SSO, Attended training program on "Operation and Maintenance of Wavelength Dispersive X-ray Fluorescence (WD-XRF)", held at Institute of Mining, Mineralogy and Metallurgy (IMMM), BCSIR, from 06-10 March 2022
12. Md. Sohel Rana, SO, Participated in Training on "Rheometer, Microviscometer, Refractometer with Density Module" from 3-7 April 2022 by Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka 1205
13. Md. Imam Shohel Hossain, SO, Participated in Training on Wavelength Dispersive X-Ray Fluorescence (WD-XRF) from 06-10 March, 2022 at Institute of Mining, Mineralogy and Metallurgy (IMMM), Joypurhat.
14. Md. Imam Shohel Hossain, SO, Participated in Training on Rheometer, Microviscometer, Refractometer with Density Module, from 03-07 April, 2022 at BCSIR, Dhaka
15. Md. Imam Shohel Hossain, SO, Participated in Training on Fourier-Transform Infrared Spectrophotometer (FTIR) and Universal Testing Machine (UTM), from 08-12 May, 2022 at Nayarhat, Savar, Dhaka
16. Md. Shams Shahriar, SO, In house training course on GC-MS arranged at INARS

SPONSORED R&D PROJECT:

1. Development of Sustainable and environment-friendly Pavement blocks with Rice husk ash. Mst. Shanjida Sultana, Dr. Mohammad Nazim Zaman, Pradip Kumar Biswas, Md. Imam Sohel Hossain.

ACADEMIC RESEARCH GUIDANCE/ SUPERVISION:

S.N	Title of Research	Research Category	Name of student	Name of academic Institution	Name of supervisors in BCSIR
1.	Provenance, weathering and depositional environments of Padma river sediments, Bangladesh	MS	Oyon Saha	University of Barisal	Dr. Pradip Kumar Biswas, PSO, IMMM, BCSIR, Joypurhat
2.	Geochemistry, of Sandstone-Mudstone suits of Carboniferous-Permian Gondwana Group, Dighipara Basin, Bangladesh: Implication for Provenance, Weathering, Tectonic setting, Biogeochemical environment and climate change.	MS	Tahosin Islam Orni	University of Barisal	Dr. Pradip Kumar Biswas, PSO, IMMM, BCSIR, Joypurhat
3.	Increasing calorific value of Peat by mixing it with charcoal and soft wood.	BSc	Fahim Mahfuz Kabir	Jessore University of Science & Technology	Dr. Pradip Kumar Biswas, PSO, IMMM, BCSIR, Joypurhat
4.	Characterization of Peat in Baghia Chanda beel	BSc	Khadija Akter Rita	Jessore University of Science & Technology	Dr. Pradip Kumar Biswas, PSO, IMMM, BCSIR, Joypurhat

TRAINING PROGRAM:

In addition to research activities and analytical services, each year the institute arranges several training programs on instrumental methods relevant to Mining, Mineralogy, and Metallurgical fields as well as office management.

SEMINAR ON R&D ACTIVITIES:

Each year the Institute of Mining, Mineralogy and Metallurgy arranges seminars on Research and Development activities on a monthly basis. In the seminars, generally, scientists and engineers present the methodology, progress, and achievements of their ongoing R&D projects.

MEETING WITH STAKEHOLDERS/WORKSHOP:

Every year IMMM arranges a meeting with its stakeholders to exchange the views of the researchers. Stakeholders including businessmen, entrepreneurs, and journalists discuss and express their views with scientists about the leased-out processes and the market demand for national and international aspects.

Accordingly, a Workshop entitled "Development of Natural Resources & involvement of IMMM in industrialization" was held on 22 December 2021 in the premises of the Institute of Mining, Mineralogy and Metallurgy, Joypurhat.

Md. Shoriful Islam, Deputy Commissioner, Joypurhat adorned the program being present as Special guest.

Dr. Mohammad Nazim Zaman, Director (In-Charge), IMMM, BCSIR, Dhaka presided over the program.

The businessmen, entrepreneurs, bankers, journalists as well as respected citizens of Joypurhat and its nearby areas attended the workshop enthusiastically.

The main goal of the workshop was to present the quality of the invented products of the institute, achieved through research, to the businessmen and entrepreneurs, to handover technology to erect new industries, to deliver technical assistance, to create bridge between research and industries, to generate employment opportunities and thus achieve socio-economic development of the country.

There was a comprehensive presentation by the Director (In-Charge) of the institute focusing on the products already developed in IMMM as well as previous, current and future theme of research in this institute. Moreover, there was an open discussion among the research personnel of the institute, businessmen, entrepreneurs, journalists and all invited guests regarding the products of IMMM, technology to manufacture these product, profitability and technical problems faced in the relevant industries and their potential solutions.



Meeting Photographs



Mineral Processing Plant visit after meeting

BCSIR SCIENTIFIC AND INDUSTRIAL TECHNOLOGY FAIR:

Every calendar year IMMM arranges a science fair titled 'BCSIR Science and Industry-Technology Fair' involving the students of High schools and Colleges from different districts of the North Bengal region. The participants display their scientific talents in this fair which is funded by the Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka, Bangladesh.

A scientific fair of young scientists from different Schools/Madrasas/Colleges of Rajshahi and Rangpur Divisions was held in the premises of IMMM, Joypurhat during 20-22 January, 2022. **Mr. Md. Masum** Ahmed Bhiuyan, Police Super, Joypurhat inaugurated the fair and went round the stalls and appreciated the young scientists for their technological innovations. In this year 165 students from 29 schools/colleges/madrasas have participated with 83 projects. There was a rush of people in the fair, organized by IMMM. At the closing ceremony **Mr Jhangir Alam**, Additional Deputy Comissioner, Joypurhat and Md. Solaiman Ali, Chairman, Upozila Porisod went round the fair and distributed the certificates and prizes among the participants. **Dr. Mohammad Nazim Zaman**, Convener of the BCSIR Scientific and Industrial Technology fair, tried his best to make the fair a grand success and future model.



Photographs of Science Fair-2022

ANALYTICAL PROBLEM SOLVED:

This institute is engaged in the analysis of core samples of the nationally important Padma Multipurpose Bridge project from Foundation Consultation Limited. Mineral separation, mineralogical and geochemical analysis of the samples of Premier Minerals Ltd, Carbon Mining Co. Ltd, Getco Mining, Institute of Water Modeling, Samof exploration and industries like Nasir Glass In., Padma Feed and Chicks, Bengle Ceramics, etc., and different government organizations such as GSB, RAB, Customs, etc., have been analyzed. The analytical service of tensile strength testing of MS rod has been done which was given by LGED, Municipality, Upazila Parishad of Joypurhat, and Naogaon, Districts, etc. During the year about 60 analytical services were provided by different divisions of IMMM. We mainly analyze and solve the following problems with their relevant instruments:

1. Compositional analysis of rocks, sand, minerals, ceramics, etc. using WD-XRF
2. Phase determination of solids using XRD
3. Analysis of aqueous solutions using AAS & ICP-MS
4. Tensile strength testing of MS rods using UTM
5. Mineral separation using IRMS, EPS, Flotation Cell, and Isodynamic separator
6. CHNSO analysis of carbonaceous matter using Elemental Analyzer
7. Determination of the Calorific value of carbonaceous matter using a bomb calorimeter
8. Particle size analysis using laser diffraction
9. The compressive modulus of rocks using automatic rock testing apparatus
10. Proximate analysis of carbonaceous materials.

ADP PROJECT

To enhance research activities on heavy minerals of river sand an Annual Development Project (ADP) namely, **"Establishment of Mineral Processing Center at IMMM of BCSIR, Joypurhat"** under the Ministry of Science and Technology approved by ECNEC in the duration of 01/01/2017-30/06/2021

has successfully implemented. The newly established Mineral Processing Center (MPC) strengthened the institute as well as provided tremendous research facilities to BCSIR and other several Govt. and Non-Govt. organization. There is a lot of sand mineral processing equipment and analytical equipment installed by this ADP project. The MPC could be turned into a cornerstone of scientific research and contribute a lot to the nation in the field of science and technology especially mineral processing research as well as boost the country's economy.

MEMORABLE PHOTOGRAPHS:





LIST OF THE MOST IMPORTANT INSTRUMENTS USED FOR RESEARCH AND ANALYTICAL SERVICES:



Model: MG6.3, HG10i
Brand: Mineral Technologies
Origin: Australia
Spirals are gravity concentrators used for the separation of heavy minerals like ilmenite, rutile, zircon, garnet, and monazite, etc. from light minerals like quartz and feldspar.



Automated Mineral Liberation Analyser includes special software packages with SEM with WDX and EDX/S
Model: Sigma 300 FESEM
Brand: Carl Zeiss Microscopy Ltd.
Origin: UK
Used to analyze minerals phases, textural studies & image analysis by EDS automation for ore characterization, process optimization, and search for metallic and non-metallic minerals, industrial minerals, precious metals, and rare earth, etc.



Electrostatic Plate Separator, Model : C162-101
 Brand Name and Country of Origin: Carrara, Australia
 Used For: The mineral separation from river sand and grinded hard rock of three R&D projects of IMMM has been carried out.



Induced Roll Magnetic Separator, Model: MIH(13)111-5
 Brand Name and Country of Origin: Autotec, USA
 Used For: The mineral separation from river sand and ground hard rock of three R&D projects of IMMM has been carried out.



Ore/Reflected Microscope, Model: om62a000a
 Brand Name and Country of Origin: Microscopes Inc. the USA
 Inclusion, exsolution, surface structure, etc. of rocks and minerals of the polished block are observed by this microscope.



Thin section system, Model: 381460256
 Brand Name and Country of Origin: Petrothin, BUEHLER, USA
 Used For: Cutting the thin section of rock and minerals for petrological sample analysis is done by this unit.



Grinder Polisher, Model: 496050

Brand Name and Country of Origin: Buehler USA

Used For: The thin section slide of rock and minerals for petrological sample analysis by polarizing microscope is prepared by this unit. The petrological slide for 4 students from the University of Rajshahi for their academic research has been prepared.



Polarizing Microscope, Model: ML 9300

Brand Name and Country of Origin: MEIJI Japan

Used For: Mineral identification, Grain counting of different R&D projects, and academic research for university students have been done.



Binocular Microscope, Model: EMZ-5TR

Brand Name and Country of Origin: MEIJI Japan

Used For: Mineral Grain counting of different R&D projects has been done.



X-ray Fluoresce Spectrometer (XRF). Model: Rigaku ZXS Primus

Brand Name and Country of Origin: Rigaku, Japan

Used For: Elemental analysis of different products and raw materials of 13 R&D projects of IMMM and a few R&D projects of BCSIR, research samples of the students of different universities have been carried out by this machine

BUDGET ALLOCATION AND EXPENDITURE IN 2021-2022

Sector Name	Budget Allocation 2021-2022	Total Expenditure 2021-2022	Total Income 2021-2022
Pay and Allowance	1,98,73,478.00	1,95,70,204.00	9,67,697.00
Supply and Services (R&D) and others	1,98,70,563.00	1,92,11,502.00	—
Repair and Maintenance	60,25,000.00	52,15,561.00	—
Capital Expenditure	16,84,000.00	16,45,462.00	—
Analytical Service Render	—	—	3,60,500.00
Total	4,74,53,041.00	4,56,42,729.00	13,28,197.00

LIST OF THE DIRECTORS WORKED IN IMMM

SL No	Name	Duration	
		From	To
1.	Dr. M. Sanwar Hossain Mondol (Project Director)	07-01-2001	22-09-2005
2.	Dr. Md. Yunus Miah (Project Director)	23-09-2005	31-03-2009
3.	Dr. Md. Yunus Miah (Director-in-charge)	01-04-2009	05-08-2009
4.	Dr. Md. Yunus Miah (Officer- in-charge)	06-08-2009	05-08-2010
5.	Dr. Smarajit Kumar Roy (Director)	06-08-2009	17-10-2010
6.	Mr. Sudhangshu Kumar Roy (Director- in- charge)	18-03-2010	08-03-2011
7.	Mr Sudhangshu Kumar Roy (Director)	09-03-2011	02-07-2011
8.	Mrs. Mahfuza Khatun (Director- in- charge)	03-07-2011	18-10-2011
9.	Md. Shahhidul Islam (Director-in-charge)	19-10-2011	18-04-2012
10.	Dr. Md. Zahurul Haque (Director- in- charge)	19-04-2011	06-06-2012
11.	Dr. Abdus Samad (Director-in-charge)	07-06-2012	19-08-2013
12.	Mr. Md. Moyazem Hossain (Director)	20-08-2013	23-02-2014
13.	Dr. Md. Abdul Hai (Director-in-charge)	24-02-2014	18-05-2014
14.	Dr. Mohammad Nazim Zaman (Director-in-charge)	10-05-2014	Present

MANPOWER

Research Wing

Sl No.	Name	Designation
1	Dr. Mohammad Nazim Zaman	Chief Scientific Officer
2	Dr. Md. Abdus Salam (Att-Chattogram Laboratory)	Senior Principal Engineer
3	Md. Aminur Raham	Principal Scientific Officer
4	Dr. Pradip Kumar Biswas	Principal Scientific Officer
5	Mst. Kamrun Nahar	Principal Scientific Officer
6	Nahid Jahan	Principal Engineer
7	Sharmin Sultana	Senior Scientific Officer
8	Mst. Shanjida Sultana	Senior Scientific Officer
9	Mohammad Sajjad Hossain	Senior Scientific Officer
10	Md. Sha Alam	Senior Scientific Officer
11	Md. Khairul Islam (Deputation)	Senior Engineer
12	Syed Shafquat Mahmood	Scientific Officer
13	Md. Shohel Rana	Scientific Officer
14	Md. Imam Sohel Hossain	Scientific Officer
15	Kazi Md. Yasin Arafat (Deputation)	Scientific Officer
16	Md. Shams Shahriar	Scientific Officer
17	Most. Nilufa Yeasmin	Scientific Officer
18	Md. Ripaj Uddin	Scientific Officer
19	Md. Nuruzzaman	Scientific Officer
20	Abu Yousuf	Scientific Officer
21	Abdul Kader Fakir	Scientific Officer
22	Md. Hasnain Mustak	Scientific Officer
23	Asma Shafiq Shathi	Scientific Officer
24	Kamruzzaman	Technician
25	Md. Helal Uddin	Technician
26	Md. Abdul Alim	Junior Technician
27	Md. Arafat Hossain	Junior Technician
28	Md. Firoz Shah	Junior Technician

Administrative Wing:

SI No.	Name	Designation
1	Kamal Chandra Dey	Administrative Officer (In-charge)
2	Md. Faruk Azam	P.A. to Director
3	Md. Hafizur Rahman	Steno-Typist Cum Computer Operator
4	Md. Fazlur Rahman	LDA Cum Computer Operator
5	Md. Gaziul Haque	LDA Cum Computer Operator
6	Md. Imdadul Islam	LDA
7	Md. Rasel kabir	Library Assistant

Inauguration of Tree Corner in Mujib Centenary by Professor Dr. Md. Aftab Ali Shaikh, Chairman, BCSIR



