Mashrafi Bin Mobarak
Scientific Officer
Institute of Glass and Ceramic Research and Testing (IGCRT)
Bangladesh Council of Scientific and Industrial Research (BCSIR)

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Educational Qualifications

2016

Master of Science (thesis-based) in Applied Chemistry and Chemical Engineering
University of Dhaka, Dhaka-1000, Bangladesh
GPA: 3.90 out of 4 (Exam held: July 2017; Result Published: Aug 2018)
Merit position: 3rd

2015

Bachelor of Science in Applied Chemistry and Chemical Engineering
University of Dhaka, Dhaka-1000, Bangladesh
CGPA: 3.70 out of 4 (Exam Held: Nov 2015; Result Published: Sep 2016)
Merit position: 5th

Professional Affiliations

May 2019 – Present

Scientific Officer
Institute of Glass and Ceramic Research and Testing (IGCRT)
Bangladesh Council of Scientific and Industrial Research (BCSIR)
Major Responsibilities: Conducting research based on R&D projects, operating sophisticated instruments, providing analytical services, training and supervision of undergraduate students.

Sep 2022 – Feb 2023

Lecturer (Adjunct) - Chemistry
Department of Civil Engineering
Sonargaon University
Major Responsibilities: Preparing class lecture, conducting both online & offline classes, extra classes, problem solving, conducting exams and grading, etc.

Dec 2018 – May 2019

Research Fellow
Institute of Glass and Ceramic Research and Testing (IGCRT)
Bangladesh Council of Scientific and Industrial Research (BCSIR)
Major Responsibilities: Conducting research based on R&D projects, operating sophisticated instruments, taking care of the laboratory.

June 2018 – Sep 2018

Quality Control Officer
Advanced Chemical Industries (ACI) Pharmaceuticals Limited.
ACI Centre 245, Tejgaon Industrial Area, Dhaka-1208, Bangladesh.
Major Responsibilities: Ensuring quality of the products through testing, identifying defects, approving processes, auditing and reporting.

Research Areas of Expertise

- Nanomaterials
- Energy materials
- X-ray diffractometry
- Electrochemical sensing
- Waste valorization
- Carbon based materials
- Functional materials
- Green and sustainable materials
- Electron microscopy

Research Interest

I am interested in development and characterization of nanomaterials and functional materials, emphasizing structure-property correlations, spectroscopy, and electrochemical analysis for energy and environmental applications.

Research Projects

From BCSIR

- Functionalization of waste-derived hydroxyapatite with advanced materials for environmental remediation and electrochemical sensing. (Ongoing)
- Preparation of ceramic-graphene oxide-based composite for removal of textile dyes from aqueous system.
- Biosynthesized Zinc Oxide nanoparticles for biomedical and catalytic applications.
- Green synthesis of metal oxide nanoparticles for assessing antimicrobial activity.

From BCSIR

- Application of hydroxyapatite for control release drug delivery.
- Synthesis of calcium-based compounds from waste materials for industrial application.
- Preparation of bio-material from waste fish scale and its bioactivity study.
- Removal of toxic elements from textile effluent by developing ceramic based membrane filter.
- Fabrication of biocompatible scaffold from waste natural sources for orthopedic application.
- Development of bioceramic-polymer composite reinforced with graphene for treatment of tannery effluent.
- Synthesis of biomaterials in granular and paste form for orthopedic and dental application.

From Ministry of Science and Technology

- Synthesis of nano calcium silicate-based compounds for controlled drug loading and release applications.
- Development of calcium phosphate-based materials utilizing commercial/household waste for treatment of wastewater.
- Waste-utilized preparation of hydroxyapatite for amoxicillin delivery: Impact of synthesis methodology.
- Synthesis and in-situ drug loading of hydroxyapatite utilizing waste material and evaluation of its drug release profile for the treatment of osteomyelitis.

Research Accomplishments

Publications

1) **Mobarak, M. B.***; Hossain, Md. S.; Tabassum, S.; Uddin, Md. N.; Hossain, Md. S.; Tanvir, N. I.; Chowdhury, F.; Ahmed, S. Sustainable Nano-Hydroxyapatite from Eggshell Waste for pH-Responsive Doxycycline Delivery: In Situ Loading, Biphasic Release Kinetics, and Enhanced Antibacterial Activity against Pathogens. *ACS Sustainable Resource Management. 2026, 3, 2, 575–588*
2) **Mobarak, M. B.***; Sohag Hossain, M.; Tanjim Khan, A.; Chowdhury, F.; Ahmed, S. Sustainable Synthesis of Biocompatible Nano-Hydroxyapatite from Seashell (Micro-Mollusk) Waste. *RSC Advances* 2026, 16 (4), 3152–3162
3) Chowdhury, N. R.; Pritha, N.; Sajid, S.; Mesbah, M. B.; Islam, Md. E.; Hakim, M.; **Mobarak, M. B.***; Chowdhury, F*. Plant-Mediated Green Synthesis of ZnO Nanoparticles Utilizing *Garcinia Cowa* Leaf Extract: Structural, Bioactive, and *In Silico* Molecular Docking Insights. *Next Materials* 2026, 10, 101575
4) **Mobarak, M. B.***; Hossain, M. S.; Chowdhury, F.; Tarannum, N.; Mesbah, M. B.; Tanvir, N. I.; Akhtar, U. S.; Ahmed, S. From Discarded to Desired: Valorization of Zn–C Battery Waste into Crystalline ZnO Nanoparticles with Crystallographic Insights and Antibacterial Efficacy. *RSC advances*. 2025, 15 (46), 38454–38469
5) Hossain, M. S.; Sahadat Hossain, Md.; Chowdhury, F.; Quddus, Md. S.; Akhtar, U. S.; Tanvir, N. I.; Ahmed, S.; **Mobarak, M. B*.** Facile Fabrication of Seashell-Derived Hydroxyapatite-Graphene Oxide (HAp/GO) Composites for High-Performance Dye Adsorption. *ACS Sustainable Resource Management* 2025, 2, 10, 1917–1928
6) **Mobarak, M.B.*;** Tabassum, S.; Hossain, M.S.; Tarannum, N.; Chowdhury, F.; Hossain, M.S.; Tanvir, N.I.; and Ahmed, S. Comparative evaluation of amoxicillin loading and release behavior from waste-derived hydroxyapatite synthesized by solid-state and wet chemical routes. *RSC advances* 2025, 15 (42), 35617-35633.
7) Sohag Hossain, M.; Alam Aumi, S.; Tarannum, N.; Chowdhury, F.; Hossain, M. S.; Farid Ahmed, M.; Islam Tanvir, N.; Sarmeen Akhtar, U.; Ahmed, S.; **Mobarak, M. B.*** Upcycling Battery Waste into Zn-BTC Metal Organic Framework for Dual Applications in Electrochemical Sensing of Uric Acid and Antibacterial Applications. *RSC Advances* 2025, 15 (37), 30564–30575.
8) **Mobarak, M. B.***; Fahim, S. A.; Hossain, M. S.; Chowdhury, F.; Tanvir, N. I.; Akhtar, U. S.; Ahmed, S. Deproteinization Controlled Phase Selection in Calcium Phosphate Biomaterials Derived from Tenualosa Ilisha Fish Scale Waste: A Sustainable Valorization Approach. *ACS Sustainable Resource Management* 2025, 2, 8, 1528–1539.
9) Mustafi, S.; Yousuf, A.; Pinky, N. S.; Khanom, R.; **Mobarak, M. B.;** Uddin, M. N. Characterization of Glass–Ceramic Tiles Utilizing Rice Husk Ash and Waste Glass Powder as a Flux. *J Aust Ceram Soc* 2025.
10) Hossain, M. S.; **Mobarak, M. B.;** Ahmed, M. F.; Akhtar, U. S.; Bashar, M. S.; Ahmed, S. Structural Modification of Nano TiO2 Using Stearic Acid for Electrochemical Detection of Cd Ions in Aqueous Systems. *Electrochimica Acta* 2025, 521, 145878.
11) **Mobarak, M. B.*;** Foysal Sikder, M.; Sidratul Muntaha, K.; Islam, S.; Fazle Rabbi, S. M.; Chowdhury, F. Plant Extract-Mediated Green-Synthesized CuO Nanoparticles for Environmental and Microbial Remediation: A Review Covering Basic Understandings to Mechanistic Study. *Nanoscale Advances* 2025, 7 (9), 2418–2445.

Publications

12) Tabassum, S.; Hossain, M. S.; **Mobarak, M. B.;** Nigar, F.; Ahmed, S. Synthesis of Nano Calcium Silicates from Waste Calcite and Aragonite Phase for Efficient Adsorptive Removal of Industrial Organic Pollutants. *Arabian Journal of Chemistry* 2024, 105901.
13) **Mobarak, M. B.;** Uddin, M. N.; Chowdhury, F.; Hossain, M. S.; Mahmud, M.; Sarkar, S.; Tanvir, N. I.; Ahmed, S. Solid-State Synthesis of Poultry Waste Derived Hydroxyapatite: Effect of Calcination Temperature on Crystallographic Parameters and Biomedical Competency. *Journal of Molecular Structure* 2024, 1301, 137321.
14) **Mobarak, M. B.;** Chowdhury, F.; Ahmed, S. Preparation and Characterization of Highly Crystalline Hydroxyapatite (HAp) from the Scales of an Anadromous Fish (*Tenualosa Ilisha*): A Comparative Study with the Freshwater Fish Scale (*Labeo Rohita*) Derived HAp. *RSC advances* 2024, 14 (54), 39874–39889.
15) Hossain, M. S.; Hossain, M. S.; Ahmed, S.; **Mobarak, M. B*.** Characterization and Adsorption Performance of Nano-Hydroxyapatite Synthesized from Conus Litteratus Waste Seashells for Congo Red Dye Removal. *RSC advances* 2024, 14 (52), 38560–38577.
16) **Mobarak, M. B.;** Chowdhury, F.; Uddin, M. N.; Hossain, M. S.; Akhtar, U.; Tanvir, N. I.; Shaikh, M. A. A.; Ahmed, S. Poultry Waste Derived In-Situ Drug Loaded Nano-Hydroxyapatite Bio-Ceramic Material for Osteomyelitis Treatment: In-Vitro Drug Release and Biocompatibility Studies. *Materials Advances* 2024, 5, 9716–9730.
17) Tabassum, N.; Anjum, R.; Haque, P.; Hossain, M. S.; **Mobarak, M. B.;** Quddus, M. S.; Chowdhury, F.; Rahman, L.; Islam, D.; Ahmed, S. Ag–Co Ferrite-Based Magnetic Polymeric Composite Film: A Breakthrough in Cationic Dye Remediation for Sustainable Environment. *RSC advances* 2024, 14 (49), 36557–36575.
18) **Mobarak, M. B.;** Pinky, N. S.; Mustafi, S.; Chowdhury, F.; Nahar, A.; Akhtar, U. S.; Quddus, M. S.; Yasmin, S.; Alam, M. A. Unveiling the Reactor Effect: A Comprehensive Characterization of Biochar Derived from Rubber Seed Shell via Pyrolysis and in-House Reactor. *RSC advances* 2024, 14 (41), 29848–29859.
19) Chowdhury, F.; **Mobarak, M. B.*;** Hakim, M.; Uddin, M. N.; Hossain, M. S.; Akhter, U. S.; Islam, D.; Ahmed, S.; Das, H. Fish Scale Utilized Biogenic Synthesis of CuO Nanoparticles: Effect of Calcination Temperature on Structural Properties and Antibacterial Activity. *New J. Chem.* 2024, 48 (39), 17038–17051.
20) Hossain, M. S.; Sarkar, S.; Tarannum, S.; Tuntun, S. M.; Mahmud, M.; **Mobarak, M. B.;** Ahmed, S. Exploration of Photo-Catalytic Activity of Nano-Hydroxyapatite Based on the Crystallographic Parameters: Estimation of Crystallite Size Using X-Ray Diffraction Data. *Journal of Saudi Chemical Society* 2023, 27 (6), 101769.
21) **Mobarak, M. B.;** Pinky, N. S.; Chowdhury, F.; Hossain, M. S.; Mahmud, M.; Quddus, M. S.; Jahan, S. A.; Ahmed, S. Environmental Remediation by Hydroxyapatite: Solid State Synthesis Utilizing Waste Chicken Eggshell and Adsorption Experiment with Congo Red Dye. *Journal of Saudi Chemical Society* 2023, 101690.
22) Pinky, N. S.; **Mobarak, M. B.*;** Mustafi, S.; Rahman, M. Z.; Nahar, A.; Saha, T.; Bahadur, N. M. Facile Preparation of Micro-Porous Biochar from Bangladeshi Sprouted Agricultural Waste (Corncob) via in-House Built Heating Chamber for Cationic Dye Removal. *Arabian Journal of Chemistry* 2023, 105080.
23) Saha, T.; **Mobarak, M. B.*;** Uddin, M. N.; Quddus, M. S.; Naim, M. R.; Pinky, N. S. Biogenic Synthesis of Copper Oxide (CuO) NPs Exploiting Averrhoa Carambola Leaf Extract and Its Potential Antibacterial Activity. *Materials Chemistry and Physics* 2023, 305, 127979.
24) **Mobarak, M. B.;** Islam, M. N.; Chowdhury, F.; Uddin, M. N.; Hossain, M. S.; Mahmud, M.; Akhtar, U. S.; Tanvir, N. I.; Ahmed, S. Calcined Chicken Eggshell-Derived Biomimetic Nano-Hydroxyapatite as a Local Drug-Delivery Aid for Doxycycline Hyclate: Characterization, Bio-Activity, Cytotoxicity, Antibacterial Activity and in Vitro Release Study. *RSC advances* 2023, 13 (51), 36209–36222.
25) Hossain, M. S.; Shaikh, M. A. A.; Jahan, S. A.; Mahmud, M.; **Mobarak, M. B.;** Uddin, M. N.; Ahmed, S. Exploring the Biomedical Competency of Gamma-Radiation Aided Hydroxyapatite and Its Composite Fabricated with Nano-Cellulose and Chitosan. *RSC advances* 2023, 13 (14), 9654–9664.
26) Hossain, M.; Hasan, M.; Mahmud, M.; **Mobarak, M. B.;** Ahmed, S. Assessment of Crystallite Size of UV-Synthesized Hydroxyapatite Using Different Model Equations. *Chemical Papers* 2022, 1–9.

Publications

27) Mobarak, M. B.; Hossain, Md. S.; Chowdhury, F.; Ahmed, S. Covid-19 Waste Facemask Conundrum: A Facile Way of Utilization through Fabricating Composite Material with Unsaturated Polyester Resin and Evaluation of Its Mechanical Properties. *Heliyon* 2022, 8 (12), e12197.

28) Hossain, M.; Mahmud, M.; **Mobarak, M. B.;** Sultana, S.; Shaikh, M.; Ali, A.; Ahmed, S. New Analytical Models for Precise Calculation of Crystallite Size: Application to Synthetic Hydroxyapatite and Natural Eggshell Crystalline Materials. *Chemical Papers* 2022, 1–7.

29) Mobarak, M. B.; Hossain, Md. S.; Chowdhury, F.; Ahmed, S. Synthesis and Characterization of CuO Nanoparticles Utilizing Waste Fish Scale and Exploitation of XRD Peak Profile Analysis for Approximating the Structural Parameters. *Arabian Journal of Chemistry* 2022, 15 (10), 104117.

30) Mahmud, M.; Sahadat Hossain, Md.; **Bin Mobarak, M.;** Sultana, S.; Sharmin, S.; Ahmed, S. Co-Precipitation Synthesis of Non-Cytotoxic and Magnetic Cobalt Ferrite Nanoparticles for Purging Heavy Metal from the Aqueous Medium: Pb(II) Adsorption Isotherms and Kinetics Study. Chemistry and Ecology 2022, 38 (6), 544–563.

31) Mobarak, M. B.; Hossain, M. S.; Yeasmin, Z.; Mahmud, M.; Rahman, M. M.; Sultana, S.; Masum, S. M.; Ahmed, S. Probing the Photocatalytic Competency of Hydroxyapatite Synthesized by Solid State and Wet Chemical Precipitation Method. *Journal of Molecular Structure* 2022, 1252, 132142.

32) Hossain, M.; Mahmud, M.; **Mobarak, M. B.;** Ahmed, S. Crystallographic Analysis of Biphasic Hydroxyapatite Synthesized by Different Methods: An Appraisal between New and Existing Models. *Chemical Papers* 2022, 76 (3), 1593–1605.

33) Mahmud, M.; Hossain, M. S.; **Mobarak, M. B.;** Quddus, M. S.; Bashar, M. S.; Akhtar, U. S.; Jahan, S. A.; Islam, D.; Ahmed, S. Engineering GO@ Zn–Hap@ CA Porous Heterostructure for Ultra-Fast and Ultra-High Adsorption Efficacy: Investigation towards the Remediation of Chromium and Lead. *Environmental Science: Advances* 2022, 1 (5), 827–848.

34) Mobarak, M. B.; Hossain, M. S.; Ahmed, S. Redispersible Polymer Powder Modified Cementitious Tile Adhesive as an Alternative to Ordinary Cement-Sand Grout. *Heliyon* 2021, 7 (11), e08411.

35) Hossain, M. S.; Mahmud, M.; Sultana, S.; **Bin Mobarak, M.;** Islam, M. S.; Ahmed, S. Coupled Effect of Particle Size of the Source Materials and Calcination Temperature on the Direct Synthesis of Hydroxyapatite. *Royal Society open science* 2021, 8 (9), 210684.

36) Sultana, S.; Hossain, M. S.; Mahmud, M.; **Mobarak, M. B.;** Kabir, M. H.; Sharmin, N.; Ahmed, S. UV-Assisted Synthesis of Hydroxyapatite from Eggshells at Ambient Temperature: Cytotoxicity, Drug Delivery and Bioactivity. *RSC Advances* 2021, 11 (6), 3686–3694.

37) Hossain, M.; **Mobarak, M. B.;** Rony, F. K.; Sultana, S.; Mahmud, M.; Ahmed, S. Fabrication and Characterization of Banana Fiber Reinforced Unsaturated Polyester Resin Based Composites. *Nano Hybrids and Composites*; Trans Tech Publ, 2020; Vol. 29, pp 84–92.

National Patents (Submitted)

1) A process for the synthesis of copper (II) oxide nano-particle using fish scale *(labeo rohita).*
2) Sustainable recycling of waste jute (*Corchorus capsularis*) fabrics to extract nano-cellulose.
3) Development of a process to induce antibacterial and antifungal properties in hydroxyapatite with the aid of gamma radiation.
4) Development of 2D material incorporated metal based composite adsorbent for combating environmental pollution.

Industrial Process

1) Preparation of superplasticizer as concrete admixture.

Conference Presentations

Oral Presentations

1) Mobarak, M.B., Chowdhury, F., Hossain, M.S., Mahmud, M. and Ahmed, S. Biomimetic nano-hydroxyapatite for local drug delivery aid for doxycycline hyclate. **BCSIR Congress-2023.**

2) Mobarak, M.B., Hossain, M.S., Chowdhury, F., and Ahmed, S. Utilization of waste facemask by fabricating composite material with unsaturated polyester resin. **BCSIR Congress-2022.**

Poster Presentations

1) Mobarak, M.B., Hossain, M.S., Mahmud, M. and Ahmed, S. A comparative investigation of crystallographic parameters and photo-degradation efficacy of hydroxyapatite synthesized using two methods, **ICEPSD-2022**.

2) Mobarak, M.B., Hossain, M.S., Mahmud, M., Sultana, S., and Ahmed, S. Cementitious composite material for the treatment of azo dye. **ICSTB-2021**.

Skills and Expertise

Sophisticated Instruments Operating Expertise

- XRD (PANalytical X'pert PRO PW 3040)
- SEM (Phenom 1481 Pro-Desktop)
- ATR-FTIR (IR-Prestige 21, Shimadzu)
- AAS (Analytik Jena novaAA 350)
- DLS-Zeta (Malvern Panalytical Zetasizer Ultra)
- UTM (Testometric M-500-30 KNCT, UK)
- UV-Vis (Hitachi U-2910)

Software Skills

- Microsoft Office™
- Origin Pro
- Highscore Plus
- Profex
- ImageJ
- Gaussian 09W
- Vesta

Skill Enhancement and Received Trainings

International Level

1) Simultaneous thermal analyzer (NETZSCH, Chennai, India, 2022. Duration: 05 days)
2) Training on R&D management (CSIR Ghaziabad, India, 2020. Duration: 07 days)

National Level

1) Training on Industrial Process Unit Operation and Process Control (TICI, Narshingdi, Bangladesh, 2015. Duration: 30 days)
2) Chittagong Urea Fertilizer in-Plant Training (Chittagong, Bangladesh, 2016. Duration: 30 Days)
3) In house training on sophisticated instruments: XRD, XPS, FESEM, BET, Electrochemical workstation, DLS-Zeta, UV-Vis NIR, STA (BCSIR, Dhaka, Bangladesh. Duration: 05 days for each instrument).

Extra-Curricular Activities

- Member-Secretary of the committee formed for the purpose of "creating a science minded nation".
- Volunteer teacher at "children's first lessons of research".
- Organizing member of "BCSIR Congress" and conferences.
- Trainer of "appropriate technology for local people" on behalf of BCSIR.
- Founder and owner of an F-market based wristwatch company.
- Former vice-president of Ullash, a cultural committee.
- Former member of Kachua Students association of University of Dhaka.
- Former player of departmental cricket team.
- Anchor and host of numerous events.

Awards and Merits

- **Merit Scholarship** in class 5, class 8, class 10 and class 12. (Full tuition fee waived in all my academic classes for academic excellence)
- **University Merit Scholarship** for Academic Excellence (funded by University of Dhaka. Duration: 2012 – 2015)
- **National Science and Technology (NST) Fellowship** for M.Sc. thesis proposal (funded by Ministry of Science and Technology, Bangladesh Secretariat; duration: 2016 – 2017)
- **Abdullah-Al-Muti Memorial Fellowship** 2018. BCSIR, Dhaka-1205
- **Directorate General Award** for securing **1st position** on foundation training course (02 months) of scientific officers, conducted by National Academy of Planning and Development (NAPD-2021).
- **Best poster presenter** of International Conference on Environmental Protection for Sustainable Development (ICEPSD-2022).

English Language Proficiency

IELTS 8.0 (Listening 8.5, Reading 9.0, Writing 7.0, and Speaking 7.5)

Proclamation

I do hereby declare that the information provided above is correct and authentic.

(Mashrafi Bin Mobarak)