Subrata Sarker

Materials Scientist | Materials Data Scientist | Electrochemist

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Website GitHub LinkedIn Scholar

Professional Summary

Materials Scientist and **Electrochemist** with 12+ years of academic and industrial research experience in photovoltaics, electrochemical energy storage, thin-film materials, device characterization, and electrochemical impedance spectroscopy (EIS). Experienced in designing and characterizing dye-sensitized solar cells (DSSC), perovskite solar cells (PSC), supercapacitors, and related electrochemical systems.

Strong analytical background with hands-on experience in Python, SQL, Power BI, Tableau, and machine learning fundamentals. Actively pursuing expertise in **Materials Informatics**—leveraging data-driven methods, statistical modeling, and AI/ML workflows to accelerate materials discovery, optimize device performance, and extract structure–property–processing relationships from complex datasets.

Published 40+ peer-reviewed research articles with 1500+ citations and an H-index of 22, demonstrating a sustained record of scientific impact and interdisciplinary innovation.

Education

Ph.D. in Materials Science and Engineering from ***Hongik University, Sejong, South Korea*** Research focused on electrochemical characterization and mathematical modeling of photovoltaic devices.

M.Sc. in Physical-Inorganic Chemistry from ***University of Dhaka, Dhaka, Bangladesh***

B.Sc. in General Chemistry from ***University of Dhaka, Dhaka, Bangladesh***

Core Competencies

Materials Science & Electrochemistry

- **Advanced Electrochemical Analysis** — EIS modeling, CV interpretation, kinetic/transport parameter extraction, mechanistic diagnostics
- **Photovoltaic & Optoelectronic Devices** — DSSC/PSC architecture engineering, defect/passivation strategies, charge-transport optimization
- **Electrochemical Energy Storage** — supercapacitor electrode design, interface engineering, electrolyte optimization
- **Thin-Film Engineering** — controlled deposition, microstructure tuning, film–substrate interface control
- **Functional Materials** — perovskites, metal oxides, carbon nanostructures, conductive polymers
- **Interfacial & Charge-Transfer Physics** — recombination pathways, band alignment, interfacial kinetics
- **Device Reliability & Degradation** — accelerated aging, environmental stress testing, failure-mode analysis
- **Spectroscopy-Driven Characterization** — optical/electrical correlation, structure–property mapping
- **Experimental Strategy** — hypothesis-driven design, design of experiments (DOE), quantitative interpretation of complex datasets

Analytical & Laboratory Techniques

- **Microscopy & Microanalysis** — AFM, SEM, EDS for morphology, topology, and compositional profiling
- **Spectroscopic Methods** — UV–Vis, FT-IR, PL for electronic/structural insights
- **Electrochemical Instrumentation** — high-precision potentiostats, impedance analyzers, advanced measurement workflows
- **Controlled-Atmosphere Processing** — Oxygen (O_2)/Moisture (H_2O)-sensitive fabrication and device encapsulation
- **Thin-Film & Device Fabrication** — multilayer stack engineering, surface preparation, encapsulation reliability
- **Scientific Operations** — instrumentation calibration, method validation, SOP creation and optimization

Data Analytics & Programming

- **Python for Scientific Computing** — NumPy, SciPy, Pandas, Matplotlib, Scikit-learn for modeling and analysis
- **Data Engineering Workflows** — ETL, feature engineering, reproducible pipelines for experimental and device datasets
- **Statistical & ML Methods** — regression, clustering, dimensionality reduction, predictive modeling for materials discovery
- **Database & Query Systems** — SQL — MySQL, PostgreSQL — for structured scientific data management
- **Visualization & BI** — Power BI, Tableau, Cognos, Looker Studio for insight-driven reporting
- **Version-Controlled Research** — Git/GitHub for reproducible scientific workflows

Cloud & Technical Skills

- **AWS Cloud Infrastructure** — hands-on familiarity with Route 53, compute (EC2), storage (S3), networking (VPC), identity (IAM), and databases (RDS)
- **Serverless Systems** — Lambda, API Gateway, S3, CloudFront for automated data pipelines, microservices, and low-latency deployments
- **Cloud-Native Automation** — CI/CD orchestration, GitHub Actions, automated testing, artifact versioning, and environment provisioning
- **Distributed Application Deployment** — static and dynamic site hosting, global content delivery, and performance optimization
- **Modern Web Frameworks** — Astro and React.js for scientific dashboards, cloud-integrated interfaces, and data-driven applications

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Professional Experience

Research Professor

Hongik University, Sejong, South Korea

March 2023 – May 2025

- Conducted advanced research on dye-sensitized solar cells and supercapacitors.
- Designed and optimized electrochemical characterization workflows using EIS and related electrochemical techniques.
- Investigated charge transport, recombination behavior, and device degradation mechanisms.
- Supervised graduate and undergraduate students in laboratory research activities.
- Conducted laboratory classes and provided instruction in electrochemistry and materials science topics.
- Published multiple peer-reviewed journal articles.
- Collaborated with interdisciplinary research groups on energy materials and device engineering.
- Managed scientific instrumentation and laboratory operations.

Visiting Scholar

Coppin State University, Baltimore, Maryland, USA

April 2024 – May 2024

- Presented research on electrochemical characterization of dye-sensitized solar cells.
- Demonstrated electrochemical impedance spectroscopy (EIS) methodologies.
- Collaborated with faculty and researchers on electrochemical materials characterization.
- Participated in academic discussions and research seminars.

Research Professor

University of Skill Enrichment and Technology (USET), Narayanganj, Bangladesh

January 2022 – May 2023

- Conducted undergraduate classes.
- Collaborated with interdisciplinary research groups on electrochemical sensors and energy devices.

Research Professor

Korea University, Sejong, South Korea

March 2019 – Sep 2021

- Conducted advanced research on perovskite solar cells.
- Conducted laboratory classes and provided instruction in electrochemistry and materials science topics.
- Published multiple peer-reviewed journal articles in materials science.
- Collaborated with interdisciplinary research groups on energy materials and device engineering.

Postdoctoral Researcher

Hongik University, Sejong, South Korea

March 2016 – May 2018

- Conducted advanced research on dye-sensitized solar cells.
- Designed and optimized electrochemical characterization workflows using EIS and related electrochemical techniques.
- Investigated charge transport, recombination behavior, and device degradation mechanisms.
- Supervised graduate and undergraduate students in laboratory research activities.
- Conducted laboratory classes and provided instruction in electrochemistry and materials science topics.
- Published multiple peer-reviewed journal articles in materials science and electrochemistry.
- Collaborated with interdisciplinary research groups on energy materials and device engineering.
- Managed scientific instrumentation and laboratory operations.

Graduate Researcher

Hongik University, Sejong, South Korea

March 2013 – August 2013

- Conducted advanced research on dye-sensitized solar cells.
- Designed and optimized electrochemical characterization workflows using EIS and related electrochemical techniques.
- Investigated charge transport, recombination behavior, and device degradation mechanisms.
- Published multiple peer-reviewed journal articles in materials science and electrochemistry.
- Managed scientific instrumentation and laboratory operations.

Graduate Researcher

Konkuk University, South Korea

September 2007 – December 2012

- Conducted research in photovoltaic devices.
- Fabricated and characterized dye-sensitized solar cells.
- Performed extensive electrochemical and spectroscopic analysis.
- Developed expertise in thin-film processing and device optimization.
- Published multiple peer-reviewed journal articles.

Quality Assurance Officer

Quasem Drycells Ltd., Tangail, Bangladesh

August 2003 – August 2007

- Performed analytical tests of raw materials for dry cells (Zinc-Carbon Battery).
- Analyzed the results of testing and determined the acceptability of results against pre-determined criteria.
- Reviewed, and edited SOPs, reports, and other documentation.
- Reviewed the implementation and efficiency of quality and inspection systems.
- Evaluated the adequacy of quality assurance standards.
- Coordinated and supported on-site audits conducted by internal and external providers.
- Collaborated with functional departments to resolve issues.

Quality Assurance Officer

Opsonin Pharma Ltd., Barisal, Bangladesh

June 2002 – July 2003

- Reviewed new test procedures and assays.
- Analysed existing product issues and provided appropriate resolutions.
- Participated in training programs for analysts.

Chemist

Meghna Cycle Ltd., Dhaka, Bangladesh

July 2001 – May 2002

- Maintained accurate inventory of chemicals.
- Maintained accurate records of quality inspections, audits, and deviations.
- Oversaw testing and inspection of raw materials, components, and finished products.
- Monitored production processes to identify and address quality issues.
- Collaborated with production teams to identify and resolve quality-related challenges.

Research Fellow

University of Dhaka, Bose Center, Dhaka, Bangladesh

March 2001 – June 2001

- Studied colloidal manganese dioxide (MnO_2) as a viable and cost-effective catalyst for mitigating unburnt hydrocarbons in vehicle exhaust

Research Interests

- Electrochemistry
- Electrochemical Impedance Spectroscopy (EIS)
- Dye-Sensitized Solar Cells
- Perovskite Solar Cells
- Supercapacitors
- Batteries and Energy Storage
- Thin-Film Materials
- Semiconductor Interfaces
- Materials Informatics
- Scientific Data Analytics
- AI-Assisted Scientific Research

Publications & Academic Impact

- 40+ peer-reviewed journal publications
- 1500+ citations
- H-index: 22

Selected Projects

AWS-Powered Personal Website Infrastructure

- Built and deployed personal websites using Astro framework and AWS.
- Configured S3 static hosting, CloudFront CDN, Route 53 DNS, and CI/CD pipelines.
- Implemented secure contact form architecture using API Gateway, Lambda, and Amazon SES.
- Configured GitHub Actions workflows for automated deployment.

Power BI Sales Analytics Dashboard

- Developed analytical dashboards using Power BI and SQL.
- Built star-schema data models for sales reporting.
- Created KPI tracking and visualization workflows.
- Performed ETL and data transformation operations.

Python-Based ETL Workflow

- Developed configurable Python ETL pipelines for structured data processing.
- Implemented logging, anomaly tracking, and schema normalization.
- Automated cleaning and transformation of large datasets.

Certifications & Training**

- IBM Data Analyst Professional Certificate
- AWS Cloud Architect Nanodegree
- Prompt Engineering for ChatGPT
- Advanced Data Analysis
- Trustworthy Generative AI

Teaching & Mentoring**

- Mentored graduate and undergraduate students in laboratory research.
- Provided instruction and guidance in electrochemistry, spectroscopy, kinetics, and materials science.
- Assisted students with experimental design and scientific analysis.
- Supported collaborative and interdisciplinary research environments.

Technical Writing & Communication

- Scientific manuscript preparation and peer-reviewed publication
- Technical presentations and demonstrations
- Research proposal development
- Scientific data visualization and reporting
- Cross-disciplinary technical communication

Additional Information

- Open to opportunities in materials science, electrochemistry, energy materials, materials informatics, and data analytics