Hanan Hakim AIMMM

R&D Scientist, Electrochemistry and Complexation Chemistry
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PROFESSIONAL SUMMARY

R&D scientist working where electrochemistry meets complexation chemistry, with an MSc in Advanced Materials Science and Engineering from Imperial College London and a BSc in Chemistry, both from technical universities. Spent eight months at the Henry Royce Institute electrodepositing nickel cobalt films under controlled current, where the work was identifying and controlling the four variables that limited run to run stability of the deposit: current density distribution, composition drift in the electrolyte, competing hydrogen evolution at the working electrode, and substrate preparation. Predicts the same behaviour computationally by coupling Butler-Volmer electrode kinetics to Nernst-Planck mass transport in COMSOL Multiphysics. Solution chemistry spans ligand assisted synthesis, pH and speciation control, co-precipitation, and published work on organic inhibitor adsorption at a metal surface in acid. Three years of research across four laboratories in the UK and Indonesia, six publications, and process development carried through to industrialisation and technology transfer.

EDUCATION

MSc Advanced Materials Science and Engineering, Imperial College London - London, UK Sep 2024 - Sep 2025
- Merit, DIC. Dissertation on the electrodeposition of nickel cobalt hydroxide for catalytic oxidation, carried out at the Henry Royce Institute. Distinction in Machine Learning for Materials.

BSc Chemistry, Sepuluh Nopember Institute of Technology, a technical university - Surabaya, Indonesia Jul 2017 - Aug 2021
- Cum Laude, top 10 percent of cohort. GPA 3.51 of 4.00. Thesis on chitosan templated mesoporous hydroxyapatite.

Certificate, Energy Innovation and Emerging Technologies, Stanford University Apr 2025 - Nov 2025

RESEARCH AND DEVELOPMENT EXPERIENCE

Graduate Research Engineer, Electrocatalysis, The Henry Royce Institute - London, UK Jan 2025 - Aug 2025
UK national institute for advanced materials. Industry sponsored programme on electrochemical conversion of waste glycerol.
- Electrodeposited nickel cobalt hydroxide films onto conductive oxide substrates under controlled current across an eight month industry sponsored programme, owning the entire electrochemical platform and operating cells with reactions at both electrodes alongside compressed gas cylinders and pressurised systems, with a written COSHH and risk assessment before every procedure.
- Identified and controlled the four failure modes limiting run to run stability of the deposit: film thickness non-uniformity driven by current density distribution, nickel to cobalt composition drift verified by XPS, competing hydrogen evolution at the working electrode, and inconsistent substrate preparation.
- Explained why performance varied between compositions by linking deposition conditions to the resulting structure using SEM, TEM and XRD, screened five candidate compositions against a fixed sponsor deadline, and delivered the selection decision four to six weeks early with a single recommendation the sponsor adopted.
- Replaced a six hour manual reporting workflow running on a licensed proprietary system with a Python tool, cutting reporting time by 25 percent, removing the licence cost and setting the laboratory standard method.

Founder and Technical Consultant, Atomalyst Group Indonesia - Surakarta, Indonesia Feb 2023 - Aug 2024
Technical advisory serving multinational manufacturers in chemicals, consumer goods and aerospace.
- Led technology transfer into client manufacturing operations as the single point of contact for engineering leadership, running the technical workshops and staying available to the process engineers taking the work forward.
- Authored the technical procedures, staged development plans and debrief reports for every engagement, written to be read by shop floor engineers and by management, so each client finished with a written basis for the next phase.
- Ran technical and supplier evaluation with senior engineering and procurement staff across seven or more concurrent engagements, identifying around 20 percent cost reduction with no change to specification; client teams adopted the evaluation and risk frameworks as their own standard.
- Founded the practice from nothing and recruited, trained and led a four person technical team across three sites and a portfolio worth around USD 0.7 million in 19 months.

Research and Development Engineer, Nano Center Indonesia - South Tangerang, Indonesia Jun 2022 - Dec 2022
National applied nanotechnology research centre working on clean energy and advanced materials.
- Developed a reflux route using phosphoric acid and ammonia to digest locally sourced ilmenite ore and convert it to phase pure anatase TiO2, controlling metal ion speciation through acid and base concentration and confirming the phase by XRD; published in AIP Conference Proceedings.
- Raised yield on a waste to product route from 70 to more than 90 percent by ranking the largest contributors to loss and correcting them in order, verified against a mass balance, and published the method as first author.
- Applied design of experiments to calcination temperature, residence time and pH across more than 20 batch runs to isolate the variables controlling output, monitored run to run drift, and set the resulting process specifications across furnace, reflux and hydrothermal routes.
- Produced the six month capital and operating cost viability assessment that the client used as the basis for its investment decision, and presented the findings directly to client R and D leadership.

Research Assistant, BRIN, National Research and Innovation Agency - Serpong, Indonesia Jul 2020 - May 2021
Indonesian national government research institution.
- Prepared and formulated chitosan and aloe vera polysaccharide systems as chelating and structure directing templates, controlling precursor preparation and gelation conditions to direct pore structure, confirmed at 3.1 to 3.8 nm by BET surface area analysis and electron microscopy.
- Designed and validated the low temperature synthesis route from first principles for mesoporous biphasic calcium phosphate, published in Materials Science Forum.
- Corrected an off target product phase across two iterations, tracing the deviation by XRD phase analysis back to precursor preparation and furnace conditions during calcination, with the corrected run delivering the target phase.
- Re-engineered the same synthesis onto a lower temperature route that cut process energy consumption by 30 percent, running solution based crystallisation and co-precipitation on pressurised equipment under standing safety procedures.

RESEARCH AND TECHNICAL SKILLS

- **Electrochemistry and Electrodeposition:** Galvanostatic electrodeposition of metal and metal hydroxide films, the deposition regime underlying electroforming; two-electrode and three-electrode cell operation; current density distribution and deposit thickness uniformity; competing hydrogen evolution; aqueous electrolyte systems and composition drift; cyclic voltammetry, electrochemical impedance spectroscopy, chronoamperometry; corrosion rate evaluation
- **Complexation and Solution Chemistry:** Ligand assisted and templated synthesis using chitosan and plant derived chelating agents; metal ion speciation controlled through pH and reagent concentration; ammonia and phosphoric acid ore digestion; co-precipitation, reflux and hydrothermal crystallisation; wet chemistry
- **Electrochemical Modelling and Data:** Butler-Volmer electrode kinetics coupled to Nernst-Planck mass transport by finite element in COMSOL Multiphysics for current density distribution, validated against analytical solutions; Python (pandas, scikit-learn, XGBoost); SQL, Power BI, Origin
- **Characterisation:** SEM with EDS, TEM, XRD with Rietveld refinement and crystallite sizing, XPS, XRF, FTIR-ATR, TGA, BET surface area, zeta potential, AFM
- **Process Development and Industrialisation:** Literature review and test planning; design of experiments (DOE) across temperature, residence time and pH; root cause analysis, 8D, PFMEA with RPN ranking; statistical process control (SPC), Cp and Cpk; SOP and specification authoring; scale-up and technology transfer to process engineers and shop floor; COSHH, pressurised systems, ISO 9001:2015
- **Languages:** English (C1 Advanced), Bahasa Indonesia (Native), Arabic (Conversational), Dutch (beginner, actively studying toward working proficiency)

SELECTED TECHNICAL PROJECTS

Finite Element Modelling of Electrochemical Systems, Imperial College London Jan 2025 - May 2025
- Built and solved a model of current density distribution across a corroding metal geometry in COMSOL Multiphysics, coupling Butler-Volmer electrode kinetics with Nernst-Planck mass transport, and verified the mesh against exact analytical solutions before using the output.
- Solved the Poisson equation across a semiconductor p-n junction to determine depletion region widths from dopant concentrations and align the electron chemical potentials.

Unknown Material Identification by Multi-Technique Characterisation, Imperial College London Oct 2024 - Dec 2024
- Identified two unknown thin films from blind samples with no prior information, resolving one as a polystyrene templated SiO2 inverse opal and the other as WO3 particles on a tetragonal SnO2 inverse opal.
- Indexed both phases by XRD against the Crystallography Open Database, refined lattice parameters by Rietveld and sized crystallites at 16.0 and 26.9 nm from peak broadening, then confirmed bonding by FTIR-ATR, composition by SEM-EDS and surface roughness by AFM, cross-validating between techniques rather than relying on a single measurement.

Machine Learning Property Prediction for Materials, Imperial College London, Distinction Feb 2025 - Mar 2025
- Benchmarked Random Forest, XGBoost, Bayesian Ridge and k-nearest neighbours on 2,154 compositions featurised to 135 descriptors under one common protocol, using an 80:20 split, ten-fold cross-validation and GridSearchCV; XGBoost led every metric at an R2 of 0.82 and RMSE of 0.604 eV.
- Identified covalent radius, melting temperature, electronegativity and group number as the dominant predictors from the feature importances, and validated the regression by classification at a ROC-AUC of 0.87.

ADDITIONAL EXPERIENCE

Associate Consultant, 180 Degrees Consulting, Imperial College London - London, UK Nov 2025 - Jan 2026
- Traced 82 percent of customer attrition to a single root cause across 2.9 million records using structured hypothesis testing, then presented the findings as a prioritised set of interventions.

Energy Storage Analyst, Imperial College Energy Society - London, UK Nov 2024 - Jul 2025
- Built the cost model pricing grid scale storage at GBP 49 to 66 per MWh, stress tested it across 10 scenarios, and co-wrote a chapter of the 2025 University Climate Report commissioned by the UK Department for Energy Security and Net Zero.

PUBLICATIONS AND RESEARCH OUTPUT

- The effect of adding green inhibitor D-galactose on the corrosion rate of aluminium alloy 5052 in sulfuric acid media. *International Journal of Innovation in Mechanical Engineering and Advanced Materials*, 2023.
- Recent progress and rational design of perovskite based chemosensors: a review. *Journal of Alloys and Compounds*, volume 962, 2023.
- Utilisation of local ilmenite as a precursor in the reflux method with H3PO4 and NH3 to synthesise anatase TiO2. *AIP Conference Proceedings*, 2025.
- High-yield green synthesis of hydroxyapatite nanoparticles from oyster shells for dye wastewater removal. *AIP Conference Proceedings*, 2025. First author.
- Six publications with 14 citations, four peer reviewed, one as first author.

CERTIFICATIONS AND ADDITIONAL INFORMATION

- **Location and Availability:** Available to relocate to the Eerbeek, Zutphen, Deventer, Arnhem or Nijmegen area and to start immediately. Available full time, above the 32 hour minimum.
- **Work Authorisation:** Indonesian national with the full right to work in the UK on a Graduate visa. Requires employer sponsored authorisation in the Netherlands through the highly skilled migrant route, and is free to relocate once sponsorship is arranged.
- **Certifications and Membership:** Associate of the Institute of Materials, Minerals and Mining (AIMMM), undertaking CEng registration through IOM3. Lean Six Sigma White Belt. ISO 9001:2015 quality management. COSHH, CPD Certified and City and Guilds Assured, 2026.
- **Recognition:** BUMI Leadership Scholar, top 6 nationally, 2020. Geneva Challenge 2025 Global Finalist. Second Place, Imperial Global Health Hackathon, 2025.