# Akash Ghosal

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## SUMMARY

I bring a robust technical foundation in material science, encompassing material development, and characterisation techniques. I specialised in the designing and analysing of innovative nano-structured materials(Ceramics based) for diverse applications, including energy conversion and storage, battery/cell, electronics, and sensors. My master's thesis, showcased my proficiency in research, data and numerical analysis with cutting edge technology. My academic and professional journey demonstrates a passion for innovation and collaborative problem-solving, positioning me as an asset to dynamic teams.

## TECHNICAL SKILLS

**Data Analysis & Scripting:** Mathematica, MS Excel, Python, MATLAB, LaTex, Origin, GNUPLOT, Office 365
**Computation & Design:** ANSYS, COMSOL Multiphysics, LAMMPS, SolidWorks, SketchUp, AutoCAD, Fusion360
**Material Science Research Techniques:** XRD, SEM, EDX, XPS, FTIR, AFM, ALD-CVD, PVD, EIS, BET, DC 4W
**Statistical Modelling:** Molecular Dynamics Simulation, Monte Carlo methods, MLOps, Microscopy Image Processing

## PROFESSIONAL EXPERIENCE

- **Cadillac Engineering, Kolkata, India** *[2018-2021]*

**Design Engineer**: Key responsibilities were simulating the behaviour of any type of viscous liquid and particles, to optimise the design and operation of auto backwash filters to improve efficiency and performance, where the filtration ranges from 10 to 500 micron on elements that were constructed of perforated sheet and wire mesh of stainless steel (SS-304, SS-316), in shape of basket, disc, cartridge and conical. Worked on production enhancement of these filters for high volume manufacturing by identifying and eliminating root cause/process weakness, with a thorough quality check.

## ACADEMIC DETAILS

**MSc. Nanotechnology & Materials Engineering, Gdańsk University of Technology** *[2021-2023]*
**Grade : 4.367/5; Final Grade : Very Good (Polish)**

**Thesis:** Exsolution as a trendy way of producing electrodes with high catalytic activity for Solid Oxide Fuel Cells, (Supervisor : Dr. hab. inż. Beata Bochentyn)
- Goal : Tailoring the exsolution of Fe-containing nanoparticles from the La and Ce co-doped strontium titanates.

- Fabrication of Anode materials and then examination for structural stability in order to determine the optimal amount of Fe doping into the B sublattice of the perovskite
- Series of materials were produced in which, in addition to the fixed Fe content, a second admixture : Ni and/or Co was also introduced
- A critical analysis of the XRD and SEM results was performed for all reduced powders to investigate the exsolution mechanism in these materials, their structural stability, and the characteristics of the formed nanoparticles.

**Research Interest** : Solid Oxide Fuel Cells, Solar Cells, Catalysis, Battery Materials, Additive Manufacturing, Laser-based Materials Processing, Electrochemical energy storage, Semiconductor & Chips, Electronics materials

**B.Tech Mechanical Engineering, Techno India University** *[2014-2018]*
**Grade : 7.32/10**

**Thesis:** Designing transportable vacuum insulated cryogenics vessel : design and analysis

- To optimise thermal performance, structural integrity, and practicality to meet the demands of diverse cryogenic applications.
- Simulating and analysing the structural integrity, thermal behaviour, and stress distribution of the vessel under various operating conditions using ANSYS.

## RESEARCH EXPERIENCE

**Research Project:** Solid-State synthesis of silver-doped mixed-conducting Oxide Perovskite Ceramics: a study of structural and electrical properties. (Supervisor : Dr. inż. Tadeusz Miruszewski)

- Fabrication of Ceramic materials
- Phase Characterisation with XRD
- Sample morphology and microstructure with SEM
- Density & Porosity measurement of the samples
- Electrical measurement of the samples with DC 4W method
- Analysis of electrical properties of the samples (resistivity & conductivity)
- Chemical & Elemental Analysis with XPS and EDX method respectively
- Drafting of the research report

**Group Project:** Design, construction and testing of free-standing structures for electro-analytical applications, made with the use of 3D printing. (Supervisor : Dr hab. inż. Jacek Ryl)

- Goal: to carry on with electrochemical analysis with these 3D printed electrodes, to remove caffeine from the electrolyte solution by using the Differential Pulse Voltammetry technique (DPV)
- The structures were designed and constructed using computer-aided design(CAD) software and 3D printing techniques, such as the FDM method (fused deposition modelling).
- The resulting structures were tested for their mechanical properties, including stiffness and stability, as well as for their electro-analytical performance.

**Lab Project:** Deposition of Aluminium Oxide Thin Films on gold platforms using Atomic Layer Deposition (ALD) Method. (Supervisor : Dr inż. Marcin Łapiński)

- Goal: To optimise the deposition process with a focus on achieving precise control over film thickness, uniformity, and material properties, thereby enabling the fabrication of high-quality thin film structures for various semiconductor, photonics, and electronic applications
- Deposited thin films were investigated with UV-vis spectroscopy and it concluded that on increasing the thickness, the absorbance decreases with absorption wavelength shifted to a higher value.

## ACADEMIC PROJECTS & ACHIEVEMENTS

- Investigation of the structural insights of the $Fe_2O_3$ dimer (kite structure) with SCF Method of Quantum Computation.
- Specific heat of Argon crystal with Molecular dynamics simulation using Lennard-Jones potential.
- Synthesis of Au-Ag nanoparticles for surface plasmon resonance bio-sensing using UV-vis spectroscopy.
- Rector’s Scholarship for best academic records - twice in a row from Faculty of Applied Physics and Mathematics.
- Scattering Theory Summer School, University of L'Aquila
- Internship Trainee (Offshore Operation Specialist), Kolkata Port Trust
- Summer Intern, Autotech Services LTD. (TATA Motors authorised workshop of Lexus Motors)

## CERTIFICATION

- Six Sigma Green Belt | Accredited, Six Sigma Academy Amsterdam (SSAA)
- Lean Management Certification | Lean Expert | Accredited, Six Sigma Academy Amsterdam (SSAA)
- IATF VDA Process Flow PFMEA Control Plan | Udemy

## MOOCs

- Introduction to Machine Learning in Production, (Online Course by Prof. Andrew Ng, Coursera)
- The Hardware of a Quantum Computer, (Online Course by DelftX, EDX.org)
- Architecture, Algorithms, and Protocols of a Quantum Computer and Quantum Internet, (Online Course by DelftX, EDX.org)

Github repository: https://github.com/Akashghosal09/agforyou