

Ali Shafaghi

Ph.D. Mechatronics Engineer | Semiconductor Process Development | MEMS & Microfabrication
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Technical Portfolio: ali-shafaghi.com

Work Authorization: Aufenthaltstitel - Unrestricted work authorization in Germany



Professional Summary

Ph.D. Mechatronics Engineer with 6+ years of hands-on experience in semiconductor process development, MEMS fabrication, and cleanroom R&D. Experienced in developing and optimizing fabrication processes involving UV lithography, EBL, DRIE, CVD/PVD, thin-film processing, SU-8, and wafer-level characterization. Delivered measurable improvements in fabrication cost, process repeatability, and device performance through systematic process optimization and root-cause analysis. Experienced in MEMS process integration, device characterization, thermal/structural simulation, and cross-functional development from concept through validation.

Work Experience

Independent Process Engineering Consultant — MEMS & Microfabrication

March 2025 – July 2026

SUNUM Nanotechnology Research and Application Centre | Istanbul, Turkey

- Optimized MEMS fabrication workflows for yield improvement and process stability, identifying critical process parameters and implementing corrective measures across photolithography and deposition sequences
- Conducted structured root-cause analysis of cleanroom fabrication defects, tracing failure modes to specific process steps and delivering actionable corrective recommendations

Research Associate & R&D Engineer

July 2024 – January 2025

SUNUM Nanotechnology Research and Application Centre | Istanbul, Turkey

- Led end-to-end cleanroom prototyping using UV lithography and SU-8 polymer processing to fabricate high-aspect-ratio MEMS structures for semiconductor and microfluidic applications
- Managed system-level integration of optical fibers into polymeric MEMS structures, defining integration requirements and sub-micron alignment challenges in collaboration with cross-functional engineering teams.
- Participated in design reviews and collaborated with interdisciplinary teams to define fabrication requirements, equipment selection, and prototype development.
- Supervised 3 junior researchers, providing hands-on guidance on cleanroom process execution and experimental methodology

Research Associate & Ph.D. Candidate

January 2019 – July 2024

Sabanci University | Istanbul, Turkey

- Drove DFM optimization of SU-8-based polymeric MEMS scanning probes, refining UV lithography, DRIE, and CVD process sequences to reduce unit production costs by 50%
- Executed 100+ cleanroom process runs using UV lithography, EBL, DRIE, and CVD; systematically improved process repeatability and device yield through parametric optimization
- Integrated optical fibers into MEMS devices using precision alignment techniques and experimentally validated device performance.
- Designed and characterized MEMS-based thermal actuators and sensors, improving sensitivity and reliability through iterative process and geometry refinement
- Performed thermal and structural simulations in COMSOL Multiphysics and ANSYS to predict device deformation under thermal loads and guide design iterations
- Qualified integrated MEMS devices through experimental characterization and performance validation, documenting results to support design iterations and technology transfer.

TÜBİTAK BİLGEM YİTAL

2023 | 6 months

Semiconductor Process Development Intern | Gebze, Turkey

- Supported silicon semiconductor process development and integration, including photolithography, thin-film deposition, plasma processing, etching, and wafer-level characterization.

- Analyzed fabrication and wafer-level measurement data to investigate process variation and support troubleshooting and process optimization.

R&D and Design Engineer

March 2016 – November 2018

Azar Tahviah Company

- Designed mechanical equipment and thermal-fluid systems including heat exchangers, flow components, and custom assemblies from concept through validation.
- Performed thermal, CFD, and structural simulations using COMSOL and MATLAB to validate mechanical designs and optimize system performance.
- Conducted prototype evaluation and iterative design refinement, translating simulation findings into practical engineering improvements across development cycles.

Iranian Diesel Engine Manufacturing Co. (IDEM)

2015 | 6 months

Thermal & CFD Engineering Intern | Tabriz, Iran

- Conducted CFD and thermal analyses of engine cooling and fluid-flow systems, evaluating temperature distribution, pressure loss, and flow behavior.

Education

Ph.D. - Mechatronic Engineering

Sabanci University, Istanbul | 2019 – 2024

Thesis: Design, fabrication, and characterization of SU-8 based polymeric MEMS scanning probes with integrated thermal actuation and optical sensing

M.Sc. - Mechanical Engineering

Tabriz Azad University | 2014 – 2016

Focus: Fluid dynamics and thermal systems — simulation and experimental validation

B.Sc. - Mechanical Engineering

Tabriz University | 2009 – 2013

Focus: Fluid dynamics and thermal systems — simulation and experimental study

Skills & Technical Proficiencies

Cleanroom & Microfabrication: UV Lithography, E-beam Lithography (EBL), Deep Reactive Ion Etching (DRIE), Plasma Ashing, CVD, PVD, Sputtering, SU-8 processing, Spin Coating, Dip Coating

Systems Engineering & Integration: System Integration, Process Development, Interface Definition, Cross-Functional Collaboration, Design Verification, Performance Qualification, Root Cause Analysis, Precision Alignment

Characterization & Metrology: SEM, Atomic Force Microscopy (AFM), Raman Spectroscopy, Profilometry, Probe Station

CAD & Simulation: SOLIDWORKS, CATIA, COMSOL Multiphysics, ANSYS Fluent, MATLAB, Layout Editor

Documentation & Tools: Bill of Materials (BOMs), Process documentation, Technical reports, Experimental protocols, LaTeX, MS Office

Selected Publications

Number of peer-reviewed publications in international journals -full list available on request.

- Thermally Actuated Colloidal Tip SU-8 Scanning Probes
- Thermally Actuated Soft Actuators with Large Out-of-Plane Deflection
- Graphene as a Piezoresistive Material in Strain Sensing Applications

Languages

English (Fluent - professional working language), **German** (A2 - actively improving through intensive courses), **Turkish** (Fluent), **Persian** (Native)