

Ali Shafaghi

Ph.D. | MEMS & Microfabrication Engineer | Semiconductor Process Development
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Work Authorization: Aufenthaltstitel - Unrestricted work authorization in Germany



Professional Summary

Ph.D. Mechatronic Engineer with over 6 years of hands-on experience in MEMS microfabrication, semiconductor process development, and cleanroom manufacturing. Experienced in photolithography, sputtering, thin-film processing, PDMS and SU-8 fabrication, DRIE, CVD, and process optimization from prototype development to reproducible manufacturing. Strong background in device characterization, Design for Manufacturability (DFM), and multidisciplinary R&D, with a passion for translating innovative microfabrication concepts into scalable technologies.

Work Experience

Independent Process Engineering Consultant — MEMS & Microfabrication March 2025 – May 2026
SUNUM Nanotechnology Research and Application Centre | Istanbul, Turkey

- Optimized MEMS fabrication workflows for yield improvement and process stability by identifying critical process parameters and implementing corrective measures across photolithography, thin-film deposition, and cleanroom manufacturing processes.
- Conducted structured root-cause analysis of cleanroom fabrication defects, tracing failure modes to specific process steps and delivering actionable corrective recommendations
- Collaborated with research and engineering teams to strengthen process integration protocols and improve documentation quality across cleanroom operations

Research Associate & R&D Engineer July 2024 – January 2025
SUNUM Nanotechnology Research and Application Centre | Istanbul, Turkey

- Led end-to-end cleanroom fabrication of MEMS devices using UV photolithography, SU-8 and PDMS processing, and thin-film microfabrication techniques for semiconductor and microfluidic applications.
- Integrated optical fibers into polymeric MEMS devices, solving packaging and sub-micron alignment challenges while ensuring reliable fabrication and assembly.
- Participated in design reviews and collaborated with interdisciplinary teams to define fabrication requirements, equipment selection, and prototype development.
- Coordinated cross-functional development activities involving cleanroom fabrication, simulation, characterization, and prototype integration.
- 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 more than 100 cleanroom fabrication runs involving UV photolithography, PDMS fabrication, SU-8 processing, EBL, DRIE, CVD, sputtering, and thin-film processing, improving process repeatability and device yield.
- Developed polymer-based MEMS devices with integrated optical fibers, achieving sub-micron alignment accuracy and reproducible fabrication across multiple process iterations.
- Designed, fabricated, and characterized MEMS thermal actuators and sensors through iterative design optimization and experimental validation.
- 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.

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.
- Collaborated with manufacturing teams to improve design reliability and product performance through iterative engineering improvements.

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, PDMS

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)