

# Nate (Abolfazi) Shakouri, Ph.D.

## Principal Scientist - Catalysis, Electrochemistry & Advanced Reactors

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Chemical engineer with Ph.D.s in Chemical Engineering/Nanotechnology and 18+ years spanning academia and industry. Focused on predictive catalyst synthesis, electro/thermocatalysis, 3D-printed reactor architectures, aerospace/ECLS/propulsion systems, and data-driven optimization.

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## SELECTED ACHIEVEMENTS

- Public scholarship includes energy-conversion catalysis work in Nature Energy and related electrocatalysis venues; current citation metrics are available on Google Scholar.
- Lead technical development of the TCPS gas-processing system; designed, built, and qualified the system from scratch, with flight expected in 2027.
- Built a \$5M+ state-of-the-art catalyst lab to accelerate research-to-product.
- Set strategy and led innovation across propulsion, ISRU, ECLS, and catalytic systems.
- Mentored 50+ cross-disciplinary contributors across scientific, engineering, and product-facing work.

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## EXPERIENCE

### Principal Scientist (Catalysis, ISRU, ECLS, Propulsion)

#### Sierra Space | 2022-Present

- Set strategy and led innovation across propulsion, ISRU, ECLS, and catalytic systems; built a \$5M+ state-of-the-art catalyst lab to accelerate research-to-product.
- Lead technical development of the TCPS gas-processing system; designed, built, and qualified the system from scratch, with flight expected in 2027.
- Delivered new product lines and advanced catalysts; strengthened business development through demos and technical tours for NASA, Raytheon, and partners.
- Mentored 50+ cross-disciplinary contributors and aligned R&D with aerospace standards and safety/quality systems.
- Drove technology roadmaps from concept to deployment, integrating manufacturing, test, and compliance.

### Senior Scientist

#### NSF/UCRC Center for Rational Catalyst Synthesis | 2016-2022

- Led research in catalysis/electrocatalysis, pharmaceutical synthesis, and resource sustainability.
- Collaborated with ExxonMobil, BASF, UOP, and Biogen to translate advanced catalysts toward commercial deployment.
- Supervised postdoctoral researchers and graduate students; contributed to record-level performance in fuel cells and electrolyzers.

### Process Engineer & Lecturer

#### Oil & Gas Research Center (FUM) | 2007-2015

- Developed nanofluid thermal management for industrial heat exchangers; delivered +40% improvements in heat transfer.
- Conducted materials characterization, membrane technologies, and rheology research.
- Taught core chemical engineering courses and supported mentorship-centered instruction.

### Research/Teaching Roles

#### University of South Carolina (USC)

- Postdoctoral Fellow / Procurement Assistant (2021-2022)
- Research/Teaching/Procurement Assistant (2016-2021)
- Visiting Research Scholar/Faculty (2015-2016)

## Instructor, Chemical Engineering

Quchan University | 2009-2012

- Taught chemical engineering coursework and supported student development.

## EDUCATION

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- Ph.D., Chemical Engineering (Catalysis), University of South Carolina, USA | 2016-2021
- Ph.D., Nanotechnology (Chemical Engineering), Ferdowsi University of Mashhad, IR | 2010-2015
- M.Sc., Chemical Engineering (Advanced Nanotechnology, Transport Phenomena), Isfahan University of Technology, IR | 2007-2009
- B.Sc., Chemical Engineering (Petrochemical Processes), Isfahan University of Technology, IR | 2002-2007

## TECHNICAL SKILLS

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- Catalysis: rational synthesis, chelate-fixation, single-atom/multi-atom catalysts, washcoat/ink rheology, adhesion, catalyst synthesis and scale-up, low-PGM systems.
- Characterization: SEM/TEM/STEM, XPS, ICP-MS, FTIR/ATR-IR/Raman/UV-Vis, GC/MS, chemisorption, BET/BJH, TPR/TPD/TPO, AFM, AAS.
- Systems and software: AEM/PEM fuel cells and electrolyzers, CO<sub>2</sub>-to-fuels, VOC/NO<sub>x</sub> systems, 3D-printed lattices and flow fields, COMSOL, MATLAB, Aspen/HYSYS.
- Methods: statistics, DOE, FEM/FDM, HSE systems, environmental impact assessments, data-driven optimization, physics-informed AI.

## LEADERSHIP

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- PMP-certified technical leader with experience building labs, teams, safety systems, and research-to-product roadmaps.
- Hosted customer reviews and technical tours while partnering with NASA, AFRL/DoD, Raytheon, and industry collaborators.
- Mentored junior engineers, interns, postdoctoral researchers, graduate students, and undergraduate researchers.
- Peer reviewer for catalysis, materials, polymers, chemical engineering, environmental, and photobiology journals.

## SELECTED PUBLICATIONS AND PATENTS

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- High-performing commercial Fe-N-C cathode electrocatalyst for anion-exchange membrane fuel cells. *Nature Energy* 6, 834-843 (2021).
- Understanding how single-atom site density drives the performance and durability of PGM-free Fe-N-C cathodes in AEMFCs. *Materials Today Advances* 12, 100179 (2021).
- Enhanced performance of oxygen-functionalized, multi-walled carbon nanotubes as support for Pt and Pt-Ru bimetallic catalysts for methanol electrooxidation. *ACS Applied Energy Materials* (2020).
- Catalytic Oxidizer for Hazardous Compound Removal in TCPS Effluent Gas. *ICES* (2024).
- The LIFE Habitat Air Revitalization System Development. *ICES* (2023).
- Selected patents/disclosures include high-density isolated atoms on support substrates, scalable single-atom catalyst production, T-electrolyzer technology, and catalyst bed for extreme conditions propulsion.
- [Nature Energy DOI](#)
- [Google Scholar](#)
- [ORCID](#)

Public resume summary. Private address, phone number, references, confidential formulations, operating envelopes, and unpublished performance data are intentionally omitted.