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Engineering & Scientific Consulting

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### Professional Profile

Dr. Yasaei has a background in mechanical engineering and provides scientific and engineering consulting services to solve complex technical problems involving various types of mechanical, thermal, and fluid handling equipment and systems. He has experience in scientific investigation and prevention of accidents, failure analysis of mechanical and industrial equipment and systems as well as consumer products, origin-and-cause analysis of industrial and vehicle fires and explosions, technical forensics, technical due diligence, technology development, and design of experiment. Dr. Yasaei has contributed to expert witness and dispute resolution services in litigations and international arbitrations by analyzing design, construction, erection, commissioning (cold and hot), performance testing, operation, and maintenance of major industrial plants and equipment. Dr. Yasaei's project experience spans various industries such as chemical processing (for example, carbon capture and sequestration; nitric acid production), mining and manufacturing (for example, ferroalloy production, flat glass production, pulp and paper manufacturing), and power generation (for example, concentrating solar power generation and thermal storage). The primary focus of Dr. Yasaei's scope in these projects has been the analysis of heat and fluid handling systems (such as boilers, furnaces, heat exchangers, pumps, compressors, tubing and piping, etc.), auxiliary mechanical equipment, and safety and control devices.

Dr. Yasaei also specializes in experimental thermal and electrical characterization of materials and interfaces at nanoscale, with applications in semiconductor industry, manufacturing, and energy conversion/storage systems (including thermoelectric and electrochemical conversion technologies). His experience includes design of novel sensing and measurement systems (such as low-noise electrical measurements, thermometry analysis, and chemical vapor/gas detection), design and fabrication of customized instrumentation apparatus and measurement devices, and cryogenic temperature measurements in high and ultra-high vacuum systems. In addition, Dr. Yasaei has several years of experience in nanomaterial synthesis and micro and nanofabrication techniques including chemical vapor deposition (CVD), chemical vapor transport (CVT), atomic layer deposition (ALD), physical vapor deposition, electron-beam lithography (EBL), photolithography, plasma etching, solution and suspension processing, and film processing. He is also proficient in several microscopy and spectroscopy techniques including atomic force microscopy (AFM), conductive AFM, scanning thermal microscopy (SThM), IR microscopy, scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), Raman spectroscopy, x-ray photoelectron spectroscopy (XPS), x-ray diffraction (XRD), gas chromatography (GC), and UV-Vis-NIR spectroscopy.

### Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Illinois, Chicago, 2017

M.S., Mechanical Engineering, University of Illinois, Chicago, 2015

B.S., Mechanical Engineering, Sharif University of Technology, Iran, 2012

Postdoctoral Fellow, Northwestern University Atomic & Nanoscale Characterization Experimental (NUANCE) Center, 2017 – 2018

Dean's Scholar Fellowship, University of Illinois, Chicago, 2016-2017

Faydor Litvin Award, MIE Department, University of Illinois, Chicago, 2016-2017

Graduate Student Silver Award, Materials Research Society (MRS), 2015

Provost's Graduate Research Award, University of Illinois, Chicago, 2015-2016

Chicago Consular Corps Scholarship, University of Illinois, Chicago, 2015-2016

## Licenses and Certifications

Licensed Professional Mechanical Engineer, Texas, #141591

Project Management Professional (PMP), #3141738

Certified Fire and Explosion Investigator (CFEI) in accordance with the National Association of Fire Investigators (NAFI) National Certification Board, #24051-13801

Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with OSHA 29 CFR 1910.120

## Professional Affiliations

American Society of Mechanical Engineers (ASME), Member

Materials Research Society (MRS), Member

American Institute of Chemical Engineers (AIChE), Member

## Languages

Persian (Farsi)

## Patents

Patent Application: Photoelectrochemical Cell for Carbon Dioxide Conversion, 2018 (Salehi-Khojin A, Asadi M, Monticelli A, Yasaei P, Kumar B.)

Patent Application: Stable and Selective Humidity Detection Using Randomly Stacked Black Phosphorus Flakes, 2017 (Salehi-Khojin A, Yasaei P, Khalili-Araghi F)

Patent Application: Structured Molybdenum Disulfide Materials for Electrocatalytic Applications, 2017 (Salehi-khojin A, Behraginia A, Asadi M, Yasaei P, Foroozan T)

Patent Application: Graphene-Based Chemical Sensing Devices and Methods for Chemical Sensing, 2015 (Salehi-Khojin A, Yasaei P, Kumar B)

## Publications

Grovogui JA, Yasaei P, Witting IT, Snyder GJ, Dravid VP. Strategies to Investigate Grain Boundary Structure and Properties of Bulk Thermoelectric Samples. *Microscopy and Microanalysis* 2019; 25 (S2), 766-767

Hemmat Z, Yasaei P, Schultz JF, Hong L, Majidi L, Behranginia A, Verger L, Jiang N, Barsoum MW, Klie RF, Salehi- Khojin A. Tuning Thermal Transport Through Atomically Thin Ti<sub>3</sub>C<sub>2</sub>T<sub>z</sub> MXene by Current Annealing in Vacuum. *Advanced Functional Materials* 2019; 1805693.

Yasaei P, Murthy AA, Xu Y, Reis R, Shekhawat GS, Dravid VP. Spatial Mapping of Hot- Spots at Lateral Heterogeneities in Monolayer Transition Metal Dichalcogenides. *Advanced Materials* 2019; 1808244

Yasaei P, Tu Q, Xu Y, Verger L, Wu J, Barsoum MW, Shekhawat GS, Dravid VP. Mapping Hot-Spots at Heterogeneities of Few-Layer Ti<sub>3</sub>C<sub>2</sub> MXene Sheets. *ACS Nano* 2019;13:3301-3309.

Yasaei P, Hemmat Z, Foss CJ, Li SJ, Hong L, Behranginia A, Majidi L, Klie RF, Barsoum MW, Aksamija Z, Salehi-Khojin A. Enhanced Thermal Boundary Conductance in Few-Layer Ti<sub>3</sub>C<sub>2</sub> MXene with Encapsulation. *Advanced Materials* 2018; 30:1801629.

Asadi M, Sayahpour B, Abbasi P, Ngo AT, Karis K, Jokisaari JR, Liu C, Narayanan B, Gerard M, Yasaei P, Hu X, Mukherjee A, Lau KC, Assary RC, Khalili-Araghi F, Klie RF, Curtiss LA, Salehi-Khojin A. A Lithium-Oxygen Battery with a Long Cycle Life in an Air-like Atmosphere. *Nature* 2018; 555:502.

Behranginia A, Hemmat Z, Majee AK, Foss CJ, Yasaei P, Aksamija Z, Salehi-Khojin A. Power Dissipation of WSe<sub>2</sub> Field Effect Transistors Probed by Low-Frequency Raman Thermometry. *ACS Applied Materials & Interfaces* 2018; 10:24892-24898.

Hu X, Yasaei P, Jokisaari JR, &Ouml;güt S, Salehi-khojin A, Klie RF. Mapping Thermal Expansion Coefficients in Free-Standing 2D Materials at the Nanometer Scale. *Physical Review Letters* 2018; 120:055902.

Majidi L, Yasaei P, Warburton RE, Fuladi S, Cavin J, Hu X, Hemmat X, Cho SB, Abbasi P, Vörös M, Cheng L, Sayahpour B, Bolotin IL, Zapol P, Greeley J, Klie RF, Mishra R, Khalili- Araghi F, Curtiss LA, Salehi- Khojin A. New Class of Electrocatalysts Based on 2D Transition Metal Dichalcogenides in Ionic Liquid. *Advanced Materials* 2018; 31:1804453.

Tu Q, Spanopoulos I, Yasaei P, Stoumpos CC, Kanatzidis MG, Shekhawat GS, Dravid VP. Stretching and Breaking of Ultrathin 2D Hybrid Organic-Inorganic Perovskites. *ACS Nano* 2018; 12:10347-10354.

Yasaei P, Behranginia A, Hemmat Z, El-Ghandour A, Foster C, Salehi-Khojin A. Quantifying the Limits of Through-Plane Thermal Dissipation in 2D-Material-Based Systems. *2D Materials* 2017; 4:035027.

Yasaei P, Foss CJ, Karis K, Behranginia A, El-Ghandour A, Fathizadeh A, Majee AK, Foster C, Khalili-Araghi F, Aksamija Z, Salehi-Khojin A. Interfacial Thermal Transport in Monolayer Graphene- and MoS<sub>2</sub>-Based Devices. *Advanced Materials Interfaces* 2017; 4:1700334.

Behranginia A, Yasaei P, Majee AK, Sangwan VK, Long F, Foss CJ, Foroozan T, Fuladi S, Hantehzadeh M, Shahbazian-Yassar R, Hersam MC, Aksamija Z, Salehi-Khojin A. Direct Growth of High-Mobility and Low-Noise Lateral MoS<sub>2</sub> -Graphene Heterostructure Electronics. *Small* 2017; 13:1604301.

Long F, Yasaei P, Yao W, Salehi-Khojin A, Shahbazian-Yassar R. Anisotropic Friction of Wrinkled Graphene Grown by Chemical Vapor Deposition. *ACS Applied Materials & Interfaces* 2017; 9:20922-20927.

Asadi M, Kim K, Liu C, Addepalli AV, Abbasi P, Yasaei P, Phillips P, Behranginia A, Cerrato JM, Haasch R, Zapol P, Kumar B, Klie RF, Abiade J, Curtiss LA, Salehi-Khojin A. Nanostructured Transition Metal Dichalcogenide Electrocatalysts for CO<sub>2</sub> Reduction in Ionic Liquid. *Science* 2016; 353:467-470.

Nie A, Cheng Y, Ning S, Foroozan T, Yasaei P, Li W, Song B, Yuan Y, Chen L, Salehi-Khojin A, Mashayek F, Shahbazian-Yassar R. Selective Ionic Transport Pathways in Phosphorene. *Nano Letters* 2016; 16:2240-2247. Long F, Yasaei P, Sanoj S, Yao W, Král P, Salehi-Khojin A, Shahbazian-Yassar R. Characteristic Work Function Variations of Graphene Line Defects. *ACS Applied Materials & Interfaces* 2016; 8:18360-18366.

Yasaei P, Fathizadeh A, Hantehzadeh R, Majee AK, El-Ghandour A, Estrada D, Foster C, Aksamija Z, Khalili-Araghi F, Salehi-Khojin A. Bimodal Phonon Scattering in Graphene Grain Boundaries. *Nano Letters* 2015; 15:4532-4540.

Yasaei P, Kumar B, Foroozan T, Wang C, Asadi M, Tuschel D, Indacochea JE, Klie RF, Salehi-khojin A. High-Quality Black Phosphorus Atomic Layers by Liquid-Phase Exfoliation. *Advanced Materials* 2015; 27:1887-1892.

Yasaei P, Behranginia A, Foroozan T, Asadi M, Kim K, Khalili-Araghi F, Salehi-Khojin A. Stable and Selective Humidity Sensing Using Stacked Black Phosphorus Flakes. *ACS Nano* 2015; 9:9898-9905.

Behranginia A, Asadi M, Liu C, Yasaei P, Kumar B, Phillips P, Foroozan T, Waranius JC, Kim K, Abiade J, Klie RF, Curtiss LA, Salehi-Khojin A. Highly Efficient Hydrogen Evolution Reaction Using Crystalline Layered Three-Dimensional Molybdenum Disulfides Grown on Graphene Film. *Chemistry of Materials* 2015; 28:549-555.

Asadi M, Kumar B, Liu C, Phillips P, Yasaei P, Behranginia A, Zapol P, Klie RF, Curtiss LA, Salehi-Khojin A. Cathode based on Molybdenum Disulfide Nanoflakes for Lithium-Oxygen Batteries. *ACS Nano* 2015; 10:2167-2175.

Yasaei P, Kumar B, Hantehzadeh R, Kayyalha M, Baskin A, Reprin N, Wang C, Klie RF, Chen YP, Král P, Salehi-Khojin A. Chemical sensing with switchable transport channels in graphene grain boundaries. *Nature Communications* 2014; 5:4911.

Kumar B, Min K, Bashirzadeh M, Farimani AB, Bae MH, Estrada D, Kim YD, Yasaei P, Park YD, Pop E, Aluru NR, Salehi-Khojin A. The role of external defects in chemical sensing of graphene field-effect transistors. *Nano Letters* 2013; 13:1962-1968.

## **Presentations**

Yasaei P, Behranginia A, El-Ghandour A, Foster C, Salehi-Khojin A. Roles of Interface and Substrate Properties on Through-Plane Heat Dissipation in 2D-Material-Based Devices. Poster Presentation, MRS, Phoenix, AZ, 2017.

Yasaei P, Fathizadeh A, Hantehzadeh R, Majee AK, El-Ghandour A, Estrada D, Foster C, Aksamija Z, Khalili-Araghi F, Salehi-Khojin A. Thermal Transport across Individual Graphene Grain Boundaries. Oral Presentation, MRS, Boston, MA, 2015.

Yasaei P, Kumar B, Foroozan T, Salehi-Khojin A. Large-Scale Production of Black Phosphorus Atomic Layers by Liquid Phase Exfoliation. Poster Presentation, MRS, San Francisco, CA, 2015.

Yasaei P, Kumar B, Baskin A, Reprin N, Kral P, Salehi-Khojin A. Molecular Sensing at Graphene Grain Boundaries. Oral Presentation, AIChE Annual Meeting, Atlanta, GA, 2014.

## Peer Reviewer

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