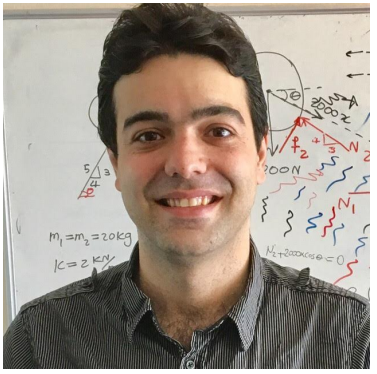
Asghar Aryanfar, PhD



Lab of Energy Materials and Sustainability (***LEMS***)

- Assistant Professor, Mechanical Engineering
Bosphorus University [map]
Bebek, Istanbul, Turkey 34342
- Visiting Associate, Chemical Engineering
California Institute of Technology [map]

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Citizenships:

- USA
- Iran

Education:

- **PhD** in Mechanical Engineering, California Institute of Technology, Pasadena, CA Jun'10-Jun'15
Co-Advisors: Michael R. Hoffmann (NAE) [link], William A. Goddard III (NAS) [link]
- **MSc** in Mechanical Engineering, California Institute of Technology, Pasadena, CA Sep'09-Jun'10
- **BSc** in Mechanical Engineering (**top 5**%), Sharif University of Technology, Tehran, Iran Sep'05-Jun'09
- **BSc** in Civil Eng (**top 2**%), Sharif University of Technology, Tehran, Iran Sep'04-Jun'08

Employments:

- Assistant Professor, Mechanical Engineering, Bogazici University, Istanbul, Turkey Mar'23 - Present
- Assistant Professor, Mechanical Engineering, American University of Beirut, Lebanon Sep'19 - Feb'23
- Lecturer, Mechatronics Eng, Bahçeşehir University, Istanbul, Turkey Sep'16 - Aug'19
- Postdoctoral Scholar, Material Sci. & Eng., UCLA, Los Angeles, CA Jun'15 - Aug'16
- Research Assistant, Caltech, Pasadena, CA Sep'09 - May'15
- Intern Researcher, FARAB hydropower plant Co, Tehran, Iran. Jun'07 - Sep'07
- Intern Researcher, Azerbaijan Steel rolling Co, Mianeh, Iran. Jun'06 - Sep'06

Current Team:

Students: Goktug Cinar (PhD) | Seif Qiblawi (ME) | Maria Khoury (ME) | Fadi Elias (ME) | Abdelrahman El Tallis (CE) | Trina Dhara (ChE) | Mahmoud Yamani (CS) | Ali Tayyar (ME) | Leatithia Zeitouny (ME).

Collaborators (3): William A. Goddard III | Irem {S}anal | Jaime Marian.

Awards:

- Masri Institute Award: $\$50K$ May'20
- University Research Board Research Grant: $\$30K$ Apr'20
- OSM Travel grant from AUB: $\$2.5K$ Mar'20
- Internal grant competition award for research advancement: $\$60K$+$\$40K$ Nov'17
- Entrepreneurship awards (KOSGEB + BIGG): $\$100K$ Nov'17, May'18

Honors:

- Senior-level engineering job offers from Tesla and Intel. Jun '16

- **American Institute of Physics** interview on extending battery's lifetime : [AIP], [Phys.org], [Chemeurope]. Oct'15
- **Cover Image**, The Journal of Chemical Physics: [Link] Oct'15
- **CNN** interview on a novel method for electrochemical treatment of wastewater. [CNN] May'13
- **SolidWorks** cover design. [SolidWorks] Jun'13
- **1st** Prize: Grant Challenge, *Gates Foundation* ,[Science], [CNN], [Reuters] Aug'12
- Graduate Fellowship, California Institute of Technology, Pasadena, CA Sep'09
- **2/110**, Civil Engineering Class, Sharif U of Tech, Tehran, Iran Sep'04 - Jun'08
- **5/120**, Mechanical Engineering Class, Sharif U of Tech, Tehran, Iran Sep'05 - Jun'09
- **6/15000**+, National Civil Engineering Olympiad, Iran Jul'08
- **78/500000**+, National governmental college entrance exam, Iran Jun'04
- **1/500000**+, National non-profit college entrance exam, Iran (exempted from military service) Jun'04

Publications :

- **Asghar Aryanfar**, T. Dhara, S. DasGupta, W.A. Goddard III **2024**

A Dynamically Equivalent Atomistic Electrochemical Paradigm for the Larger-scale Experiments

J CHEMICAL PHYSICS , 161(1): https://doi.org/10.1063/5.0208367

- **Asghar Aryanfar**, F. Elias W.A. Goddard III **2024**

Enhancing the Thermal Dissipation in Batteries via Inclusion of Central Heat Sink

J ELECTROCHEM ENERGY CONV & STORAGE 21(2): https://doi.org/10.1115/1.4062712

- **Asghar Aryanfar**, A. Tayyar, W.A. Goddard III **2023**

Dendritic propagation on circular electrodes: The impact of curvature on the packing density

PHYSICAL REVIEW E 108(1), 014801: https://doi.org/10.1103/PhysRevE.108.014801

- **Asghar Aryanfar**, M. Khoury, I Şanal, D Şeyhibrahim, J Marian **2023**

Acquiring the size distributions of the aggregates using percolation modeling

CONSTRUCTION & BUILDING MAT, 379, 131109: https://doi.org/10.1016/j.conbuildmat.2023.131109

- **Asghar Aryanfar**, T Dhara, A. Ghosh, U. Ghosh, P. Mukherjee, S. DasGupta **2023**

The Role of Pulse Duty Cycle and Frequency on Dendritic Compression

JOURNAL OF PHYSICAL CHEMISTRY C.,127, 9, 4407–4415: https://doi.org/10.1021/acs.jpcc.2c08066

- **Asghar Aryanfar**, M. El Skafi, J. Marian **2023**

Governing Failure Mechanisms of three-way Dendritic Branches under Compressive Load

MECHANICS OF MATERIALS 80, 104620: https://doi.org/10.1016/j.mechmat.2023.104620

- **Asghar Aryanfar**, A. El Tallis, J. Marian **2023**

Coupling the Corrosion- and Pressure-Assisted Stress Buildup within the Zirconium in PWR Pipes

J MINETALS METALS AND MAT (JOM) 75 (1), 120-131: https://doi.org/10.1007/s11837-022-05503-w

- **Asghar Aryanfar**, M El Skafi, W A Goddard III **2022**

An Estimation for the Effective Force Transfer Medium in Radial Loading of the Cylindrical and Spherical Geometries: J MECH SCIENCE & TECH: 36 (12), 6171-6180: https://doi.org/10.1007/s12206-022-1131-5

• **Asghar Aryanfar** **2022**
Linearized Tracking of Dendritic Evolution in Rechargeable Batteries
J ELECTROCHEMICAL SOCIETY 169 (11), 112507: https://doi.org/10.1149/1945-7111/ac9d6a

• **Asghar Aryanfar**, Y. Ghamlouche, W. A. Goddard III **2022**
Optimized Pulse Form for the Extreme Inhibition of Growing Microstructures during Electrodeposition
MRS BULLETIN, 47 (7), 665-674: https://doi.org/10.1557/s43577-022-00307-4

• **Asghar Aryanfar**, J. Jundi, S. R. Damadi, W. A. Goddard **2022**
Real-time Interface-Tracking Framework for the Evolution of the Phases during the Quenching of Steel Balls: MATERIALIA, 21, 101327: https://doi.org/10.1016/j.mtla.2022.101327

• **Asghar Aryanfar**, S. Medlej, A. Tarhini, S. R. Damadi, A. R. Tehrani, W. A. Goddard III **2021**
3D percolation modeling for predicting the thermal conductivity of graphene-polymer composites
COMPUTATIONAL MATERIALS SCIENCE, 97, 110650: https://doi.org/10.1016/j.commatsci.2021.110650

• **Asghar Aryanfar**, I. Sanal, J. Marian **2021**
Percolation-Based Image Processing for the Plastic Viscosity of Cementitious Mortar with Super Absorbent Polymer: INT J CONCTRE STRUCTURES & MAT 15(25): https://doi.org/10.1186/s40069-021-00462-z

• **Asghar Aryanfar**, Y. Ghamlouche, W. Goddard III **2021**
Real-time Control of Dendritic Propagation in Rechargeable Batteries using Adaptive Pulse Relaxation
J CHEMICAL PHYSICS: 154,194702: https://doi.org/10.1063/5.0042226.

• **Asghar Aryanfar**, S. Medlej, A. Tarhini, A. Tehrani **2021**
Elliptic Percolation Model for Predicting the Electrical Conductivity of Graphene-Polymer Composites
SOFT MATTER - 17, 2081: https://doi.org/10.1039/D0SM01950J

• **Asghar Aryanfar**, D. M. Saad, W. A. Goddard III **2021**
A Novel Method for Estimating the Charge Equilibrium within the Dendrites of Rechargeable Batteries
COMPUTATIONAL MATERIALS SCIENCE-187, 110059: https://doi.org/10.1016/j.commatsci.2020.110059

• **Asghar Aryanfar**, S. Medlej, W. A. Goddard III **2021**
Morphometry of dendritic materials in Rechargeable Batteries
J POWER SOURCES - 481, 228914: https://doi.org/10.1016/j.jpowsour.2020.228914

• **Asghar Aryanfar**, Y. Ghamlouche, W. A. Goddard III **2021**
Pulse-Reverse Protocol for Efficient Suppression of Dendritic Micro-structures in Rechargeable Batteries
ELECTROCHIMICA ACTA - 367, 137469: https://doi.org/10.1016/j.electacta.2020.137469

• **Asghar Aryanfar**, I. Sanal, J. Marian **2021**
Novel Percolation-based Measure for Fibre Efficacy in fiber-reinforced concrete beams

STRUCTURAL CONCRETE - 22(1), 264-272: https://doi.org/10.1002/suco.201900362

• **Asghar Aryanfar**, M. R. Hoffmann, W. A. Goddard **2019**
Finite-pulse waves for efficient suppression of evolving mesoscale dendrites in rechargeable batteries
PHYSICAL REVIEW E, 100, 042801: https://doi.org/10.1103/PhysRevE.100.042801

• **Asghar Aryanfar**, W. A. Goddard III, J. Marian **2019**
Constriction Percolation Model for Coupled Diffusion-Reaction Corrosion of Zr in PWR
CORROSION SCIENCE - 158, 108058: https://doi.org/10.1016/j.corsci.2019.06.013

• M. Reyes, **Asghar Aryanfar**, S. W. Baek, J. Marian **2018**
Multilayer interface tracking model of zirconium clad oxidation
J NUCLEAR MATERIALS, 509, 550-565: https://doi.org/10.1016/j.jnucmat.2018.07.025

• **Asghar Aryanfar**, D.J. Brooks, W. A. Goddard III **2018**
Theoretical pulse charge for optimal inhibition of growing dendrites
MRS ADVANCES, 1, 1-7: https://doi.org/10.1557/adv.2018.97

• C. Xu, Z. Ahmad, **Asghar Aryanfar**, V. Viswanathan, J. R. Greer **2017**
Enhanced strength and temperature dependence of mechanical properties of Li at small scales and its implications for Li metal anodes: PNAS , 114 (1), 57: https://doi.org/10.1073/pnas.1615733114

• **Asghar Aryanfar**, J. Thomas, A. VanderVen, D. Xu, M. Youssef, J. Yang, B. Yildiz, J. Marian **2016**
Integrated computational modeling of water-side corrosion in zirconium metal clad under nominal LWR operating conditions: JOM, 47, 1543-1851: https://doi.org/10.1007/s11837-016-2129-1

• L. M. Kasmaee, **Asghar Aryanfar**, Z. Chikneyan, M.R. Hoffmann, A. J. Colussi **2016**
Improving solid-electrolyte interfaces via underpotential solvent electropolymerization
CHEMICAL PHYSICS LETTERS, 661, 65: https://doi.org/10.1016/j.cplett.2016.08.045

• **Asghar Aryanfar**, T. Cheng, , A. Colussi, B. Merinov, W. Goddard, M. Hoffmann **2015**
Annealing kinetics of electrodeposited lithium dendrites
J CHEMICAL PHYSICS - 143, 134701: https://doi.org/10.1063/1.4930014

• **Asghar Aryanfar**, D. Brooks, B. Merinov, A. Colussi, W. Goddard, M. Hoffmann **2015**
Thermal relaxation of lithium dendrites
PHYS CHEM CHEM PHSYS- 17, 8000: https://doi.org/10.1039/C4CP05786D

• **Asghar Aryanfar**, D. J. Brooks, A. J. Colussi, M. R. Hoffmann **2014**
Quantifying the Dependence of Dead Lithium Crystals on Cycling Period in Lithium Metal Batteries
PHYS CHEM CHEM PHSYS, 16, 24965: https://doi.org/10.1039/C4CP03590A

• **Asghar Aryanfar**, D. Brooks, B. Merinov, W. A. Goddard, A. J. Colussi, M. R. Hoffmann **2014**
Dynamics of lithium dendrite growth and inhibition: pulse charging experiments and monte carlo calculations: J PHYS CHEM LETT, 5(10), 1721: https://doi.org/10.1021/jz500207a

• K. Cho, Y Qu, D. Kwon, H. Zhang, C. Cid, **Asghar Aryanfar**, M. R. Hoffmann **2014**

Effects of anodic potential and chloride ion on overall reactivity in semiconductor electrochemical reactors: ENV SCI & TECH - 48(4), 2377: https://doi.org/10.1021/es404137u

Conference Papers:

1. **A. Aryanfar** et al: *Image Processing for Workability of Concrete with Super Absorbent Polymer*, Int Conf in Intelligent Decision Science, Springer, Cham, 681. **2020**
2. **A. Aryanfar** et al: *Bulk properties of amorphous lithium dendrites*, ECS Trans. 80 (10), 365 **2017**
3. **A. Aryanfar** et al: *Lithium dendrite inhibition on post-charge anode surface: The kinetics role*, MRS proceedings, V. 1774. **2015**
4. **A. Aryanfar** et al: *Lithium dendrite growth control using local temperature variation*, MRS Proceedings, V. 1680. **2014**

Book Chapter:

A.Aryanfar et al: *Electropolymerization:Fundamental and Applications/Electrodes and Double Layers-* ***Advances in Material Science and Engineering***, V. 39, Nova Pub., ISBN: 978-1-53616-176-2. **2019**

Patents:

• **Asghar Aryanfar**: *Method and device for dendrite research and discovery in batteries*, US Patent 14/201, 979. **2017**

• M.R. Hoffmann, **Asghar Aryanfar**, C. Cid, K. Cho, D. J. Kwon, Y. Qu:*Self-contained PV-powered Toilet and Domestic Wastewater Disinfection System*, US Patent14/048, 163. **2014**

Invited Talks:

•MRS Fall meeting (*Session Chair*)	Dec'21	• ECS Conference, Spring 2021	May'21
• MRS Conference, Spring 2021	Apr'21	• ICAPP 2016, San Francisco, CA	May'16
• American University of Beirut	May'19	• MIT, Cambridge, MA	Jul'15
• Tesla Corporation, Palo Alto, CA	Apr'16	• MRS, San Francisco, CA	Apr'15
• EPFL, Lausanne, Switzerland	May'16	• ECS, Orlando, FL	May'14
• ECS, National Harbor, MD	Oct'17	• Sharif U of Tech, Tehran, Iran	Mar'14
• ECS, Chicago, IL	May'15	• ECS, Honolulu, HI	Oct'12
• MIT, Cambridge, MA	Dec'14	• MRS, San Francisco, CA	Apr '14

Reviewer Activities:

• APPL THERMAL ENG	2024
INT J HEAT & MASS TRANSFER	2024
• INT COMM HEAT & MASS TRANSFER (ICHMT)	2024
• INT COMM HEAT & MASS TRANSFER (ICHMT)	2023

- Physical Review E
- J Materials Chem A
- ECS Electrochemistry Letters
- Mechanics of Adv Mat & Structures
- Chemical Reviews
- J Electrochemical Society
- Physics of Fluids (x2)
- Int J Heat Mass Transfer
- Chemical Society Reviews
- J Fluid Mechanics
- J Alloys and Compounds

Teaching Experience:

- Manufacturing Tech $S23, S24$
- Finite Element Methods $F18$
- Transport Phenomena $F17$
- Mech of Materials $F16$, $F17$, $F20$
- Statics and Dynamics $F11$, $F20$, $F21$
- Structural Loading $F06$
- Computer Vision $F22$
- Mech. Design $S17$,$S18$,$S20$,$S21$, $S22$
- Vehicle Aerodynamics $F18$
- Fluid Mech & heat transfer $S17$, $S18$
- Mechanics of Materials $F10$
- Hydraulics $F07$
- Thermodynamics $F16$, $S18$, $F21$

Poster Presentation:

- Featured research, Caltech Board of Trustees, Pasadena , CA Jan′12
- International Energy Storage Conference (IPS-19), Pasadena, CA Jul'12
- Reinvent the Toilet fair, Gates Foundation, Seattle, WA Aug'12

Skills:

Python (Numpy, Matplotlib, Pandas, Tensor Flow, Scipy, Scikit Learn), MATLAB, SolidWorks (design and FEA), AutoCAD, Photoshop, LaTeX

Memberships:

Materials Research Society (MRS), Electrochemical Society (ECS), ASME, ASCE, Caltech Alumni Association.

Languages:

Azerbaijani (native) Persian English Turkish

References:

1. Prof. William A. Goddard (NAS)
Professor of Chemistry and Mat Sci and Appl. Phys.
321 Beckman Institute, Caltech
wag@caltech.edu
626-395-3093

2. Prof. Michael R. Hoffmann (NAE)
Professor of Environmental Sciences
204 Linde-Robinson Lab, Caltech
mrh@caltech.edu
626-395-4391

3. Prof. Jaime Marian
Professor (Vice Chair of Grad. Education)
3121D, Engineering V, UCLA
jmarian@ucla.edu
310-206-9161

updated: July 7, 2024