

King Abdullah University of Science and Technology (KAUST)
Environmental Science and Engineering Program,
Water Desalination and Reuse Center & Center for Desert Agriculture,
Biological and Environmental Science and Engineering Division
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ORCID# 0000-0001-8759-7812; <https://scholar.google.com/citations?user=oJSVAaEAAAAJ&hl=en>
Co-Founder, Chairman, & Chief Scientific Officer, Terraxy LLC (Terraxy.com)

HIMANSHU MISHRA

SUMMARY My translational research program pivots on fundamental science to develop technologies to address societal challenges. SandX™ and CarboSoil™ are nature-based solutions pioneered by my team for diverting organic landfills, sequestering carbon, and rehabilitating desert soils for food production and greening/landscaping. I co-founded Terraxy LLC to scale-up and commercialize the operation, and currently we are building a decentralized factory that collects waste from regional poultry farms and deploys soil amendment for local desert rehabilitation. Overall, my research program has attracted > US\$ 5M in competitive funding and produced 47 papers and 12 invention disclosures.

RESEARCH INTERESTS

- Water interfaces, wetting, microdroplet chemistry, electrification, aquatic chemistry
- Nature-based solutions for food–water–climate security, e.g., SandX™ & CarboSoil™.
- Engineered biochar (EB): pyrolysis, post-processing, and EB-based fertilizers.
- Diverting landfills, open-field agriculture, and nature conservation in Saudi Arabia.

WORK HISTORY **ASSOCIATE PROFESSOR OF ENVIRONMENTAL SCIENCE AND ENGINEERING & PRINCIPAL INVESTIGATOR AT WATER DESALINATION AND REUSE CENTER, KAUST**
ASSOCIATE FACULTY, CENTER FOR DESERT AGRICULTURE, KAUST

Jul 2020 - Present

ASSISTANT PROFESSOR OF ENVIRONMENTAL SCIENCE AND ENGINEERING & PRINCIPAL INVESTIGATOR AT WATER DESALINATION AND REUSE CENTER, KAUST

Nov 2014 – Jul 2020

ELINGS PRIZE POSTDOCTORAL FELLOW, CALIFORNIA NANOSYSTEMS INSTITUTE, UNIVERSITY OF CALIFORNIA SANTA BARBARA

Mentor: Late Prof. Jacob Israelachvili

Jul 2013 – Nov 2014

EDUCATION **PHD, CALIFORNIA INSTITUTE OF TECHNOLOGY, DEPARTMENT OF APPLIED PHYSICS & MATERIALS SCIENCE (2009-2013)**

Advisors: William A. Goddard III and Michael R. Hoffmann

Thesis: Proton Transfers at the Air-Water Interface

MS, CALIFORNIA INSTITUTE OF TECHNOLOGY, DEPARTMENT OF APPLIED PHYSICS & MATERIALS SCIENCE (2008-2009)

MS, PURDUE UNIVERSITY, SCHOOL OF MECHANICAL ENGINEERING (2005-2007)

Advisors: Timothy S. Fisher and Timothy D. Sands

Thesis: Carbon Nanotube Electrical Interfaces for Thermoelectrics

BTECH, MECHANICAL ENGINEERING, PUNJAB ENGINEERING COLLEGE, CHANDIGARH (2001-2005)

PEER-REVIEWED
JOURNAL
ARTICLES

(Google Scholar citations: 1943, *h*-index: 24, *i10*-index: 35)

1. Sadullah, M., Arunachalam, S., **Mishra, H.*** “Predicting Droplet Detachment Force: Young-Dupré Model Fails, Young-Laplace Model Prevails”, *Nature Communications Physics* **2024, 7, Article number: 89 (Commentary in Nature Community Section)**
2. Eatoo, M., **Mishra, H.***, “Busting the Myth of Spontaneous Formation of H₂O₂ at the Air–Water Interface: Contributions of the Liquid–Solid Interface and Dissolved Oxygen Exposed”, *Chemical Science* **2024, 15, 3093-3103 (Journal Cover)**
3. Arunachalam, S., **Mishra, H.***, “Collective Wetting Transitions of Submerged Gas-Entrapping Microtextures (GEMS)” (2024) *Droplet*, DOI: 10.1002/dro2.135
4. Chang*, et al., “Skimming the skaters: Genome skimming improves phylogenetic resolution of Halobatinae (Hemiptera: Gerridae)”, *Insect Systematics and Diversity* (2024)
5. Hong, P.*, **Mishra, H.**, Daffonchio, D., McCabe, M. F., “Roadmap Towards Achieving Sustainable Greening”, *Nature Water*, 2023, <https://doi.org/10.1038/s44221-023-00171-9>
6. Gallo Jr., Musskopf, N. H., Liu, X., Zhang, Z., Petry, J., Zhang, P., Thoroddsen, S., Im, H., **Mishra, H.***, “On the Formation of Hydrogen Peroxide in Water Microdroplets”, *Chemical Science*, 2022, 13, 2574–2583 (**Journal Cover; Interview in Royal Society of Chemistry’s Chemistry World and ACS Chemical & Engineering News**)
7. Gallo Jr., A., Odokonyero, Mousa, M. A., A., Reihmer, J., Morton, M. J. L., Al-Mashharawi, S., R. Marasco, Daffonchio, D., McCabe, M. F., Tester, M., **Mishra, H***, “Nature-Inspired Superhydrophobic Sand Mulches Increase Agricultural Productivity and Water-Use Efficiency in Arid Regions” *ACS Agricultural Science & Technology*, 2022, 2, 2, 276–288 (DOI:10.1021/acscagtech.1c00148) (**Journal Cover & ACS Weekly PressPac: March 16, 2022**)
8. Ali, M., Hong, P., **Mishra, H.**, Vrouwenwelder, Saikaly, P., “Adopting Circular Model: Opportunities and Challenges for Transforming Wastewater Treatment Plants into Resource Recovery Facilities in Saudi Arabia”, *Journal of Water Reuse* (2022) 12 (3): 346–365, <https://doi.org/10.2166/wrd.2022.038>

9. Yang, Z., Zhang, P., Shi, M., Julaih, A., **Mishra, H.**, Fabrizio E., Thoroddsen, S., “Direct Imaging of Polymer Filaments Pulled from Rebounding Drops”, *Soft Matter*, 2022, DOI: 10.1039/D2SM00599A
10. Odokonyero, K., Gallo Jr., A., **Mishra, H***, “Effects of Superhydrophobic Sand Mulching on Evapotranspiration and Phenotypic Responses in Tomato (*Solanum lycopersicum*) Plants Under Normal and Reduced Irrigation”, *Plant-Environment Interactions*, 2022, Vol. 3, Issue 2, 74–88 (DOI: 10.1002/pei3.10074) (**Cover**)
11. Cheng, L., **Mishra H.***, “Why did only one genus of insects, *Halobates*, take to the high seas?” **Invited review article**, *PLoS Biology*, 2022, 20(4): e3001570 (<https://doi.org/10.1371/journal.pbio.3001570>)
12. Ridwan, M. G., Shrestha, B. R., Maharjan, N., **Mishra, H.***, “Zwitterions layer but do not screen electrified interfaces in dilute solutions”, *Journal of Physical Chemistry B*, 2022 (DOI:10.1021/acs.jpcc.1c10388) (**Journal Cover**)
13. Shi, M., Das, R., Arunachalam, S., **Mishra, H.***, “Suppression of Leidenfrost Effect on Superhydrophobic Surfaces”, *Physics of Fluids*, 2021, 33, 122104,
14. Muszkopf, N., Gallo Jr., Zhang, P., **Mishra, H.***, “The Air–Water Interface of Condensed Water Microdroplets does not Produce H₂O₂”, *Journal of Physical Chemistry Letters*, 2021, 12, 46, 11422–29 (**Journal Cover**)
15. Gallo Jr., A., Tavares, F., Das, R., **Mishra, H.***, “How Particle–Particle and Liquid–Particle Interactions Govern the Fate of Evaporating Liquid Marbles”, *Soft Matter*, 2021, 17, 7628 – 7644, DOI: 10.1039/D1SM00750E (**Journal Cover**)
16. Odokonyero, K., Gallo Jr., A., **Mishra, H***, “Nature-inspired Wax-coated Jute Bags for Reducing Post-Harvest Storage Losses”, *Scientific Reports*, 2021, 11, 15354
17. Nauruzbayeva, J., Sun, Z., Gallo Jr., A., Ibrahim, M., Santamarina, J. C., **Mishra, H.***, “Electrification at Water-Hydrophobe Interfaces”, *Nature Communications*, 2020, 11, 5285, DOI: 10.1038/s41467-020-19054-8 (**Editors’ Highlights**)
18. Santana, A., Farinha, A. S. F., Torano, A. Z., Ibrahim, M., **Mishra, H***, “First-principles Based Rationally Designed Materials for treating Wastewaters”, *International Journal of Quantum Chemistry*, 2021, 121: e26501 (**Journal Cover**)
19. Arunachalam, S., Ahmad, Z., Das, R., **Mishra, H.***, “Counterintuitive Wetting Transitions in Doubly Reentrant Cavities as a Function of Surface Make-up, Hydrostatic Pressure, and Cavity Aspect Ratio”, *Advanced Materials Interfaces*, 2020, 7, 2001268. DOI:10.1002/admi.202001268 (**Journal Cover**)
20. Das, R., Ahmad, A., Nauruzbayeva, **Mishra, H.***, “Biomimetic Coating-free Superomniphobicity”, *Scientific Reports*, 2020, 10, Article number: 7934 (**Top 100 Scientific Reports chemistry papers in 2020**)
21. Mahadik, G. A., Hernandez Sanchez, J. F., Arunachalam, S., Gallo Jr., A., Farinha, A. S., Thoroddsen, S. T., **Mishra, H.***, Duarte, C. M., “Superhydrophobicity and size reduction enabled *Halobates* (Insecta: Heteroptera, Gerridae) to colonize the open ocean”, *Scientific Reports*, 2020, 10, Article number: 7785
22. Pillai, S., Santana, A., Das, R., Shrestha, B.R., Manalastas, E., **Mishra, H***, “A Molecular to Macro Level Assessment of Direct Contact Membrane Distillation for

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- Separating Organics from Water”, *Journal of Membrane Science*, 2020, Vol. 608, 118140
23. Gonzalez-Avila, S. R., Nguyen, D. M., Arunachalam, S., Domingues, E., **Mishra, H.***, Ohl, C-D., “Mitigating Cavitation Erosion Using Biomimetic Gas-Entrapping Microtextured Surfaces (GEMS)”, *Science Advances*, 2020, Vol. 6, No. 13, eaax6192
 24. Das, R., Arunachalam, S., Ahmad, Z., Manalastas, E., Syed, A., Buttner, U., **Mishra, H.***, “Proof-of-Concept for Gas-Entrapping Membranes (GEMs) Derived from Water-loving SiO₂/Si/SiO₂ Wafers for Green Desalination”, *Journal of Visualized Experiments*, 2020, Issue 157, e60583 (doi:10.3791/60583)
 25. Shrestha, B. R., Pillai, S., Santana, A., Donaldson, Jr., S. H., Pascal, T. A., **Mishra, H.***, “Nuclear Quantum Effects in Hydrophobic Nanoconfinement”, *Journal of Physical Chemistry Letters*, 2019, 10, 5530-5535 (**Journal cover**)
 26. Arunachalam, S., Domingues, E. M., Das, R., Nauruzbayeva, J., Buttner, U., Syed, A., **Mishra, H.***, “Rendering SiO₂/Si surfaces omniphobic by carving gas-entrapping microtextures comprising reentrant and doubly reentrant cavities or pillars”, *Journal of Visualized Experiments*, 2020, 156, e60403, (DOI:10.3791/60403)
 27. Gallo Jr., A., Farinha, A. S., Emwas, A-H., Santana, A., Nielsen, R. J., Goddard III, W. A., **Mishra, H.***, “Reply to the ‘Comment on “The chemical reactions in electrosprays of water do not always correspond to those at the pristine air–water interface”, by A. J. Colussi and S. Enami””, *Chemical Science*, 2019, 10
 28. Das, R., Arunachalam, S., Ahmad, Z., Manalastas, E., **Mishra, H.***, “Bio-inspired Gas-entrapping Membranes (GEMs) Derived from Common Water-wet Materials for Green Desalination”, *Journal of Membrane Science*, 2019, Vol 588, 117185
 29. Gallo Jr., A., Farinha, A. S., Dinis, M., Emwas, A-H., Santana, A., Nielsen, S., Goddard III, W. A., **Mishra, H.***, “The Chemical Reactions in Electrosprays of Water Do Not Always Correspond to Those at the Pristine Air-Water Interface”, *Chemical Science*, 2019, 10, 2566-2577 (**Journal cover**)
 30. Subramanian, N., Al-Saadi, A., Qamar, A., Gallo Jr., A., Ridwan, M. G., Lee, J-G., Pillai, S., Anjum, D., Ghaffour, N., Sharipov, F., **Mishra, H.***, “Evaluating the Potential of Superhydrophobic Nanoporous Alumina Membranes for Direct Contact Membrane Distillation”, *Journal of Colloid and Interface Science*, 2019, 533(1), 723-732
 31. Arunachalam, S., Das, R., Nauruzbayeva, Domingues, E. M., **Mishra, H.***, “Assessing Omniphobicity by Immersion”, *Journal of Colloid and Interface Science*, 2019, Vol. 534, 156-162
 32. Domingues, E. M., Arunachalam, S., Nauruzbayeva, **Mishra, H.***, “Biomimetic Coating-free Surfaces for Long-term Entrapment of Air under Wetting Liquids”, *Nature Communications*, 2018, 9, Article Number: 3606.
 33. Bera, B., Shahidzadeh, N., **Mishra, H.**, Bonn D., “Wettability of Water on Graphene Nanopowders of Different Thicknesses”, *Applied Physics Letters* 2018, 112, 151606
 34. Domingues, E. M., Arunachalam, S., **Mishra, H.***, “Doubly Reentrant Cavities Prevent Catastrophic Wetting Transitions on Intrinsically Wetting Surfaces”, *ACS Applied Materials & Interfaces*, 2017, 9, 21532-38
 35. Yutkin, M. P., Lee, J. Y., **Mishra, H.**, Patzek, T. W., Radke, C. J., “Bulk and Surface Aqueous Speciation of Calcite: Implications for Low-Salinity Waterflooding of

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- Carbonate Reservoirs”, *Society of Petroleum Engineers Journal*, 2017, Vol 23(1), pp 84-101
36. Kaufman, Y., Chen, S-Y., **Mishra, H.**, Schrader, A. M., Lee, D. W., Das, S., Donaldson Jr., S. H., Israelachvili, J. N., “Simple to Apply Wetting Model to Predict Thermodynamically Stable and Metastable Contact Angles on Textured/Rough/Patterned Surfaces”, *Journal of Physical Chemistry C*, 2017, 121, 5642-56
37. **Mishra, H.***, Schrader, A. M., Lee, D. W., Gallo Jr., A., Chen, S-Y., Kaufman, Y., Das, S., Israelachvili, J. N. “Time-Dependent Wetting Behavior of PDMS Surfaces with Bioinspired, Hierarchical Structures”, *ACS Applied Materials & Interfaces* 2016, 8, 8168–8174 ([Journal cover](#))

BEFORE JOINING KAUST

38. Colussi, A. Yabushita, S. Enami, Hoffmann, M. R., Liu, W. G., **H. Mishra**, W. A. Goddard III, “Tropospheric Aerosol as a reactive intermediate”, *Faraday Discussions*, 2013, 165, 407-420
39. **H. Mishra**, S. Enami, L. A. Stewart, R. J. Nielsen, M. R. Hoffmann, W. A. Goddard III, A. J. Colussi, “Brønsted basicity of the air-water interface”, *Proceedings of the National Academy of Sciences*, 2012, 109(46) 18679-18683 ([Commentary in Nature Chemistry: https://www.nature.com/articles/nchem.1556](#))
40. **H. Mishra**, S. Enami, R. J. Nielsen, W. A. Goddard III, M.R. Hoffmann, A. J. Colussi, “Anions dramatically enhance proton transfer across aqueous interfaces”, *Proceedings of the National Academy of Sciences*, 2012, 109(26), 10228-10232
41. **H. Mishra**, R. J. Nielsen, S. Enami, M. R. Hoffmann, A. J. Colussi, W. A. Goddard III, “Quantum chemical insights into the dissociation of nitric acid on the surface of aqueous electrolytes”, *International Journal of Quantum Chemistry*, 2012, 113(4) 413-417
42. **H. Mishra**, C. J. Yu, D. P. Chen, W.A. Goddard III, N. F. Dalleska, M. R. Hoffmann, M. S. Diallo, “Branched polymer resins with high binding capacity and selectivity for boron in aqueous solutions”, *Environmental Science & Technology*, 2012, 46(16), 8998-9004
43. S. Enami, **H. Mishra**, M. R. Hoffmann, A. J. Colussi, “Dry deposition and oligomerization of gaseous isoprene on mildly acidic surfaces”, *Journal of Physical Chemistry A*, 2012, 116 (24), 6027-6032
44. S. Enami, **H. Mishra**, M. R. Hoffmann, A. J. Colussi, “Hofmeister effects in micromolar electrolyte solutions”, *Journal of Chemical Physics*, 2012, 136(15), 154707 (pg 1-7)
45. G. Acharya, S. C. Shin, M. McDermott, **H. Mishra**, H. Park, I. C. Kwon, K. Park, “The hydrogel template method for fabrication of homogeneous nano/micro particles”, *Journal of Controlled Release*, 2010, 141(3): 314-9
46. **H. Mishra**, B. A. Cola, V. Rawat, P. B. Amama, K. G. Biswas, X. Xu, T. S. Fisher, T. D. Sands, “Bismuth telluride films electrodeposited onto carbon nanotube arrays for

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- mechanically compliant, low resistance interfaces in thermoelectric microdevices”, *Advanced Materials*, 2009, 21, 1-4
47. **H. Mishra**, S. Mukherjee, “Examining the best-fit paradigm for FEM at element level”, *Sadhāna - Journal of Engineering*, 2004, 29(6), 1-16 (published by the Indian Academy of Sciences)

ARTICLES UNDER REVIEW

48. Arunachalam, S., **Mishra, H.***, “Coating-free Underwater Breathing via Biomimicry” (under review, *Nature Communications Engineering*)
49. Muzzamil Eatoo, Koppenol, W. H., Mishra, H., “How Water Microdroplets Spontaneously Generate Hundreds of Micromoles of Hydrogen Peroxide via Interfacial Effects: Facts and Artifacts”, (under review, *PNAS*)
50. Eatoo, M., Wehbe, N., Kharbatia, N., Guo, Xianrong, **Mishra, H.***, “Why Some Metal Ions Spontaneously Form Nanoparticles in Water Microdroplets? Disentangling the Contributions of the Air-Water Interface and Bulk Redox Chemistry” (under review, *Chemical Science*)
51. Odokonyero, K., Batool Albar, Aishah Alasmadani, Lisa Exposito, Nayara Musskopf, Gallo Jr., A., **Mishra, H***, “Assessing the Effect of Superhydrophobic Sand and Date Palm Biochar on the Growth of *Moringa oleifera* under Normal and Reduced Irrigation” (under review, *Frontiers in Plant Science*)

ARTICLES UNDER PREPARATION

52. Odokonyero, K., Gallo Jr., A., **Mishra, H***, “Wax-Coated Jute Bags Enhance the Shelf-Life of Wheat and Soybean Grains Stored Over Nine Months”, (under preparation)
53. Odokonyero, K., Magdi Mousa, Gallo Jr., A., **Mishra, H***, “Comparative Assessment of Superhydrophobic Sand and Plastic Mulch for Crop Yield Enhancement in Arid Lands” (under preparation)
54. Arunachalam, S., **Mishra, H.***, “Directional Wetting Transitions – A Strategy to Protect Smart Devices Against Accidental Submersion in Water” (under preparation)
55. Albar, B., Musskopf, N. H., Farinha, A., Gallo, A., Mishra, H., “Engineering Ultrahigh Cation Exchange Capacity Biochar for Sandy Soil Amendment in Saudi Arabia” (under preparation)
56. Nayara Musskopf, Odokonyero, K., Lisa Exposito, Aishah Alasmadani, Vernooij, Bob, Gallo Jr., A., **Mishra, H***, “Date Palm Biochar and Complementary Soil Amendments Enhance Tomato (*Solanum lycopersicum*) plants’ Yields in Alkaline Sandy Soils”
57. Arunachalam, S., Sadullah, M., Qamar, A., **Mishra, H.***, “Zipper Cavities” (under preparation)
58. Albar, B., Gallo, A., Mishra, H.*, “A Simple and Inexpensive Method for Determining Surface Area of Sand Grains” (under preparation)
59. Odokonyero, K., Arunachalam, S., Gallo Jr., Ibrahim, M., Jaleel, N. M. A., **Mishra, H***, “Jute Mulches” (under preparation)

60. Laurensen, K., Mishra, H., Overmans, S., Gallo Jr., A., “Functionalized silica particles for terpenoid separation from engineered algae cultures” (under prep)

INTELLECTUAL
PROPERTY

1. Adair Gallo Jr., Batool Albar, Himanshu Mishra, Biochar post-processing into CarboSoil, KAUST Invention Disclosure (2024-088-01, USSN 63/569,824)
2. Batool Albar, Adair Gallo Jr., Himanshu Mishra, Wax-Coated-Urea-Loaded High Surface Area Biochar Formulations for Slow Nitrogen Release, KAUST Invention Disclosure (#2024-090)
3. Batool Albar, Adair Gallo Jr., Himanshu Mishra, Ozonation of biochar for enhancing its cation exchange capacity and reducing pH, KAUST Invention Disclosure (#2023-073)
4. Batool Albar, Adair Gallo Jr., Himanshu Mishra, Ozonation of carbon black for enhancing its cation exchange capacity and reducing pH, KAUST Invention Disclosure (#2023-091)
5. Laurensen, K., Mishra, H., Overmans, S., Gallo Jr., A., Alkane-functionalized silica particles for terpenoid separation from engineered algae cultures, USPTO Provisional patent filed (Aug 30, 2022)
- ~~6. Mishra, H. and Shi, M., “Coating free superomniphobic surfaces for drag reduction in thermal machinery without compromising heat transfer”, USPTO Application 63/141,101 | filed on Jan 2, 2021~~
- ~~7. Mishra, H. and Odokonyero, K., “Wax coated jute fabrics and their applications”, USPTO Application # 63/141,104 | filed on January 26th, 2021 | WO Application No. PCT/IB2022/050592~~
- ~~8. Mishra, H., Ahmad, Z., Manalastas, “A device for applying pressure during confocal microscopy”, KAUST TTO, October 7, 2019~~
- ~~9. Ohi, C.D., Mishra, H., Gonzalez, R., Ngugen, M. “Surface protection against cavitation erosion” European Patent Application EP-0752-5518, March 7th, 2019; USPTO-US 2022/0177094 A1, June 9, 2022.~~
10. Mishra, H., Arunachalam, S., Domingues, E., Das, R., “Perfluorocarbon free membranes for membrane distillation” (USPTO Application # 17/056,809) May, 2018
- ~~11. Mishra, H., Subramanian, N. “Iridium Oxide Microelectrodes for Sensing Moisture and Humid Fumes of Acids and Bases”, USPTO Application # PCT/IB2017/057502 | filed in Dec, 2016.~~
12. Mishra, H., Reihmer, J., Gallo Jr., A. “Compositions and Methods Relating to Functionalized Sands” (USPTO #11,497,177 B2, Issued on 11/15/2022) (<https://patents.google.com/patent/WO2018091986A1/en>); exclusively licensed by Terraxy LLC.
13. Mishra, H., Farinha, A. S. F., and Sinha, S. “Functionalized SiO₂ Microspheres for Extracting Oil from Produced Water”, (USPTO # PCT/IB2016/055358) Filed on September 9th, 2015 (<https://patents.google.com/patent/WO2017042709A1/en>)
14. Diallo, M. S., Yu, C. J., Mishra, H., “High Capacity Oxoanion Chelating Media from Hyperbranched Macromolecules”, US Patent #20130118986 A1 <https://patents.google.com/patent/WO2013103909A1/en>

Note: The crossed-out patent applications were withdrawn after a strategic change in KAUST.

RESEARCH TRANSLATION

1. SandX™ and CarboSoil™ IP exclusively licensed to Terraxy LLC incorporated in KSA; raised US \$1M investment in 2023–2024. Key stakeholders: RDIA, NEOM (Food and Nature Conservation Sectors), Ministry of Investment, Ministry of Environment, Water, and Agriculture, Ministry of Economy and Planning, C4IR, Aramco EPD, NCVC, KACST, Estedamah, and SABIC.
2. Aramco EPD, Khurais: A pilot site was developed in the desert with 580 Acacia plants to test the effects of SandX and CarboSoil. After 2 years of study, CarboSoil-treated plants were found to have 65% higher biomass and size than the fertilized controls.
3. Mneifa Regreening Reserve of the NEOM Nature Conservation Sector: Handled a 100 ha site where >50,000 native plants (trees, bushes, and grasses) were serviced with CarboSoil™ during November–December 2023. Target for 2024: 1 M plants.
4. Delivering turn-key plantation projects in the MENA region, viz. materials, reactors, labor, & logistics. (Snippet on SandX: <https://www.youtube.com/watch?v=R3EIB4hgB8E&t=15s>)
5. Consultancy projects: (i) full service for planting 600 native trees on a desert site in Khurais for ARAMCO (US \$32,453); (ii) Durrah Sugar factory – assessment of calcium-rich filter cake for soil amendment (SAR 20,000); (iii) NEOM (US \$1.3 M); (iv) Wadi Qadid National Park with KAUST Center for Desert Agriculture and Saudi National Center for Vegetation Cover (NCVC) – testing of date palm biochar and SandX on 10,000 trees.

HONORS AND SCHOLARLY AWARDS

- Terraxy recognized with the Europe-France Inventeurs 2024 Diploma and a Gold Medal at **Geneva Inventions** (Apr 17-21, 2024, Geneva, Switzerland)
- Terraxy selected as Deloitte Technology Fast 50 Start-ups (Impact Category) in the MENA and Cyprus region (2024, link to the announcement: <https://deloi.tt/3VXPcpT>)
- Harvard Business Review Arabia featured Terraxy Co-founders: <https://bit.ly/3U2McqR> (the most read article on HBR Arabia according to the Chief Editor)
- Journal Cover, *Chemical Science*, 2024, **15**, 3093-3103
- **Translational Research Grant** from SIRC to Terraxy for setting up an industrial facility with a target organic landfill diversion of 20,000 tons/year in Al-Johfa (2024).
- Invited Discussion Leader, Gordon Research Conference on Water and Aqueous Solutions, Holderness, New Hampshire, USA (July 21–26, 2024)
- **US \$1 M** investment from KAUST Innovation Ventures in Terraxy LLC (2023).
- **US \$10,000** ‘Plant-the-Idea’ (The Best Early-Stage Start-up) award to Terraxy at the InFlavors Expo, Riyadh, the MENA region’s largest Food & Beverages event (Oct 2023)
- **US \$140,000** cash award at Taqadam 2022–2023 Start-up Accelerator Program March 1, 2023 (Ten teams chosen among >9000 applicants worldwide)
- **World Economic Forum’s Uplink Platform** recognized Terraxy LLC as “Top Innovator in Food Ecosystems in Arid Climates”, in China (June 2023). Awarded by His Excellency Faisal F. Alibrahim, the Minister of Saudi Ministry of Economy & Planning.
- **First Place**, ITAS Arab Youth Competition (out of 117 entries), University of Doha for Science and Technology, Qatar, awarded by the **Prime Minister of Qatar** (March 1, 2023)
- Prototypes for Humanity, under the patronage of HE Sheikah Latifa, shortlisted SandX™ and CarboSoil™ among Top 100 Technologies Globally at the COP-28 in Dubai (2023).
- **US \$0.72 M** Research Translation Grant to scale-up our patented SandX technology and conduct industrial validation and testing with partners such as Aramco EPD (2022–2024)

- Distinguished Speaker, 2023 Thriving Together Conference by Saudi Youth for Sustainability, KAUST
- Invited Speaker, Shastri Conference & Lecture Series, “Water Management: Sustainability & Climate Change”, organized by IIT Tirupati and Dalhousie Univ., Canada, Mar 6-7, 2023
- International Falling Walls Competition in Berlin (Batool Albar MS–PhD student, November 11th, 2022)
- Keynote Speaker, 5th Edition of Innovations in Food Science and Human Health, Barcelona (September 20–21, 2022)
- Golden Jubilee Visiting Fellowship Endowment (2022), Institute of Chemical Engineering, Mumbai (Honorarium INR 5000 for the public lecture)
- **US \$7,000** cash prize at KAUST’s 2022 Winter Enrichment Program’s Women to Impact Competition (2nd rank among 305 entries @worldwide), Title: SandX and BiocharX soil amendment technologies.
- Keynote Speaker, Elsevier’s 11th Int’l Colloids Conference, Lisbon (June 12–15, 2022)
- Interviewed by the Royal Society of Chemistry magazine *Chemistry World*: <https://www.chemistryworld.com/news/study-casts-doubt-on-water-microdroplets-ability-to-spontaneously-produce-hydrogen-peroxide/4015169.article>
- Interview by Chemical & Engineering News, <https://cen.acs.org/research-integrity/reproducibility/Claims-water-turning-hydrogen-peroxide/100/web/2022/05>
- Cover Article, ACS Agricultural Science & Technology, DOI:10.1021/acsagscitech.1c00148 ACS Press Pac (Mar 16, 2022) <https://www.acs.org/content/acs/en/pressroom/presspacs/2022/acs-presspac-march-16-2022/wax-coated-sand-keeps-soil-wet-longer-improves-crop-yields-in-arid-regions.html>
- Cover Article, *Chemical Science* (2022) <https://doi.org/10.1039/D1SC06465G>
- Cover Article, *JPhysChemB* (2022) DOI:10.1021/acs.jpccb.1c10388
- Cover Article, *JPhysChemLetters* (2021) DOI: <https://doi.org/10.1021/acs.jpcllett.1c02953>
- Cover Article, *Soft Matter* (2021), DOI: 10.1039/D1SM00750E
- Top 100 Scientific Reports chemistry papers in 2020, DOI: 10.1038/s41598-020-64345-1
- Editors’ Highlights, *Nature Communications* (2020), DOI: 10.1038/s41467-020-19054-8
- Cover Article, *Advanced Materials Interfaces* (2020), DOI:10.1002/admi.202001268
- Cover Article, *International Journal of Quantum Chemistry* (2020) DOI:10.1002/qua.26501
- Student delegate to the 70th Lindau **Nobel Laureate** Interdisciplinary Meeting (2020 & 2021): Adair Gallo Jr., PhD student
- Invited lecture: Physical Chemistry Seminar, College of Chemistry, University of California Berkeley, CA, USA (October 15th, 2019)
- Invited lecture: Chemical Physics Seminar, Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA, USA (October 8th, 2019)
- Best Poster Prize, 45th International Conference on Micro and Nano Engineering, Rhodes, Greece (September 23-26, 2019) (Zain Ahmad, MS student) (**Out of 404 entries; cash prize: 400 Euros**)

- Session Chair, Wetting on Soft or Microtextured Surfaces, Bad Honnef, Germany (Host: Max Planck Institute for Polymer Research, Mainz, Apr 11-13, 2019)
- Cover Article, *Journal of Physical Chemistry Letters* (2019) [DOI:10.1021/acs.jpcllett.9b01835](https://doi.org/10.1021/acs.jpcllett.9b01835)
- Cover Article, *Chemical Science* (2019) [DOI: 10.1039/C8SC05538F](https://doi.org/10.1039/C8SC05538F)
- Lecture at the United Nations COP-24 meeting on climate change at Katowice, Poland (Dec, 2018) got >92k views on [Facebook](#) through Institute of Sustainable Development (IISD) reporting.
- Elsevier Best Poster Award, 7th International Colloids Conference, Sitges-Barcelona, Spain (2017) ([Three selected out of a pool of 277 entries](#))
- First Place, Doctoral Level Students Poster Contest, 5th Water Arabia Conference and Exhibition, Al Khobar, Saudi Arabia (2017) (Mr. [Adair Gallo Jr.](#), PhD student)
- Cover Article: *ACS Applied Materials & Interfaces* (2016) [DOI: 10.1021/acsami.5b10721](https://doi.org/10.1021/acsami.5b10721)
- Elings Postdoctoral Fellowship, California NanoSystems Institute, University of California Santa Barbara (2013–2014): US\$ 60,000/yr (for 3 yrs) + US\$ 10,000 discretionary (Host: Jacob Israelachvili)
- Gilbert Ling Prize, 7th Conf. on the Physics, Chemistry and Biology of Water, VT (2012)
- The Young Investigator Award (50,000 Yen cash award) Seventh Congress of the International Society for Theoretical Chemical Physics, Tokyo (2011)
- Division Fellowship, California Institute of Technology (2008)

COMPETITIVE RESEARCH FUNDING

1. Develop scaled up enrichment process for biochar to manufacture CarboSoil at scale, KAUST National Transformation Institute Grant (US\$1M; REI/1/6215-01-01)
2. Realizing Nature Conservation in NEOM (100 M trees by 2030) Via Engineered Biochar and Superhydrophobic Sand and Best Practices: Field Trials and Laboratory Investigation. **Principal Investigator: H. Mishra**, NEOM Nature Conservation Sector, ([US\\$ 1.3 M](#); under review)
3. Mega-Scale Production, Deployment, and Validation of KAUST Soil-Amendment Technologies (CarboSoil™ and SandX™) and Smart Field Monitoring Towards Realizing NEOM's Giga-Scale Sustainability Projects. **Principal Investigator: H. Mishra**, Research Development and Innovation Authority, KSA, ([US\\$ 5 M](#); under review)
4. Manufacturing Fully-Automated CarboSoil™ and SandX™ Reactors to Exploit Synergies between KSA-wide Organic Landfill Diversion and Sustainability Giga-Projects: Seeding a New Industry. **Principal Investigator: H. Mishra**, Research Development and Innovation Authority, KSA ([US\\$ 2.5 M](#); under review)
5. Development, Scale-up, and Industrial Validation of Soil Amendment Technologies for Enhanced Irrigation Efficiency in the Middle East and Beyond. **Principal Investigator: H. Mishra**, Research Translation Grant, Innovation and Economic Development, KAUST, ([US\\$ 0.72 M](#); 2022-2024)
6. Scaling production of high value biochar: feedstock variability, material characterization, and field trials. Co-PIs: **Mishra, H.**, Sarathy, M., Grade, C., Laurensen, K., and Fatayer, S., KAUST Circular Carbon Initiative and Climate & Livability Initiative ([\\$75 k/yr](#); 2022-2024)

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7. Exploring Red Sea *Halobates*. Competitive Research Grant, Office of Sponsored Research, KAUST. **Principal Investigator: H. Mishra**; Co-PI: Lanna Cheng (Scripps Institution of Oceanography), Daniele Daffonchio and Carlos Duarte (KAUST), Vassilios Roussis and Fay Ionnaous, ([\\$400,000](#); 2022-2024)
 8. Probing Membrane-Water Interfaces to Improve Water Purification Efficiency. KAUST's Center Partnership Fund Program 2019. Principal Investigator: Richard Saykally (University of California Berkeley); **Co-PI: H. Mishra** ([US\\$ 125,000](#); 2019-2020)
 9. Field Trials of Superhydrophobic Sand Mulches with Crops and Trees Towards Boosting Vegetation in Drylands. Office of Sponsored Research, KAUST. **Principal Investigator: H. Mishra**; Co-PI: Profs. Magdi Mousa & Adel Qurashi (KAU, Jeddah). ([\\$590,999](#); 2018-2021).
 10. Characterizing Condensation in Doubly Reentrant Cavity Microtextures using Neutron Imaging using DINGO. Australian Center for Neutron Scattering (ANSTO). **Principal Investigator: H. Mishra**; Co-PIs: Dr. Floriana Salvemini and Dr. Jitendra Mata, ANSTO. 2018 (Value: AU\$ 37,600).
 11. Exploring the Origins of Hydrophobic Interactions via a Complementary Experimental and Theoretical Approach. Competitive Research Grant, Office of Sponsored Research, KAUST. **Principal Investigator: H. Mishra**; Co-Principal Investigator: Tod Pascal (UC San Diego). 2018-2020 ([\\$400,000](#)).
 12. Electronic Properties of Water near Large Extended Hydrophobic Interfaces. KAUST Supercomputing Laboratory Grant. **Principal Investigator: H. Mishra**; Co-Principal Investigator: Dr. Ali Hassanali, International Center for Theoretical Physics, Trieste, Italy. 2017-2019. (25 Million CPU hours)
 13. Ion interactions with Membranes and Surfactants. KAUST Supercomputing Laboratory Grant. **Principal Investigator: H. Mishra**; Co-Principal Investigator: Prof. Ran Friedman, Linnaeus University, Sweden and Dr. Steve Donaldson, École Normale Supérieure, Paris. (10 million CPU hours Grant value: US\$ 91,000)
 14. Exploring Proton-catalyzed Reactions at Water-hydrophobe Interfaces via Ultrasensitive Mass-spectrometry and Ultrafast Surface-specific Spectroscopy. Competitive Research Grant, Office of Sponsored Research, KAUST. **Principal Investigator: H. Mishra**; Co-Principal Investigator: Prof. Richard Saykally (University of California Berkeley). ([\\$400,000](#); 2016-2018).
 15. Understanding the hydrogen-bonded percolation networks in water. KAUST Supercomputing Laboratory Grant. **Principal Investigator: H. Mishra**; Co-Principal Investigator: Prof. Vishwanath Dalvi, Institute of Chemical Technology, Mumbai, India. 2016-2017 (3 million CPU hours of value: US\$ 40,000)
 16. KAUST Conference: International Conference on Chemistries and Physics at Hydrophobic Interfaces. Office of Sponsored Research, KAUST. **Principal Investigator: H. Mishra**. 2015-2016. ([\\$150,000](#))
 17. Wetting of Graphene and Graphene Oxide Films: Implications for Desalination. KAUST SEED Funding, Office of Sponsored Research, KAUST. Principal Investigator: Daniel Bonn
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(University of Amsterdam); **Co-Principal Investigator: H. Mishra** 2016-2017 (US\$ 100,000).

SELECTED
PRESENTATIONS

1. Mishra, H., Discussion Leader on Microdroplets, Gordon Research Conference on Water and Aqueous Systems (July 2024).
 2. Mishra, H., Invited Speaker, Telluride Science Research Center (TSRC), CO (June 2024).
 3. Invited guest at Aramco EPD, Khurais, to meet with business leaders and journalists to celebrate the establishment of the desert site (580 Acacia plants) that we built as a consultancy project with SandX and CarboSoil (Feb 11, 2024).
 4. Invited guest, KAUST Future Forum, KACST, Riyadh (Feb 12-13, 2024).
 5. Invited guest at the Saudi Green Initiative Forum, COP-28, and Prototypes for Humanities Grand Finale in Dubai (Dec 2023).
 6. Mishra, H., "Peroxide Gate at Water's Edge", Telluride Science Research Center Workshop on "Water Structure, Dynamics and Thermodynamics", June 25–29, 2023 (Invited Lecture).
 7. Mishra, H., "Spontaneous formation of H₂O₂ in water microdroplets" Gordon Research Conf. on Chemical Imaging, Easton, MA July 30–Aug 4, 2023 (Poster).
 8. Exposito, L., et al., "Effects of Biochar and Superhydrophobic Sand Mulch on Evaporation and Water-Holding Capacity in Sandy Soils", Wageningen Soil Conference, August 28th – Sept 1st, 2023, The Netherlands.
 9. Mishra, H., "SandX and CarboSoil for Food Security, Sustainable Greening, and Carbon Sequestration", presented to Aramco R&D Team from Boston (Jan 23, 2023), the Royal Commission of Al-Ula (Jan 24 & Feb 18, 2023), and **NEOM** (Jan 25, 2023).
 10. Mishra, H., "Interface Engineering for Global Food–Water–Climate Security", University of California Davis, Biological and Agricultural Engineering Department, July 21, 2022 ([Invited lecture](#))
 11. Mishra et al., "Zwitterions at Electrified Interfaces", 11th International Colloids Conference, Lisbon, Portugal, June 2022 ([Invited Keynote Speaker](#))
 12. Arunachalam et al., "Diffusion-driven directional wetting of gas-entrapping microtextured surfaces (GEMS)", 48th international conference on Micro and Nano Engineering - Eurosensors (MNE-ES), Brussels, Belgium (Aug 17–19, 2022)
 13. "SandX and Biochar as complementary technologies for enhancing water and nutrient usage efficiency in sandy alkaline soils in arid lands", 6th Asia Pacific Biochar Conference, Seoul, South Korea (Oct 23–26, 2022)
 14. 23rd Edition of International Conf. on Analytical and Applied Pyrolysis (Pyro2020), Ghent, Belgium (May 15–20, 2022)
 15. Cheng, L. et al., "Wax secretions of the ocean insect *Halobates* - functions and preliminary results", Trends in Natural Products Research: A PSE Young Scientists' Meeting", Crete, Greece (May 23-26, 2022)
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16. Sadullah, Mohammed “Subkhi”, et al., Droplet Adhesion Revisited, UK Fluids Conference, The University of Glasgow, Scotland (Sept 6–8, 2022)
 17. Mishra, H., “On the Formation of Hydrogen Peroxide in Water Microdroplets”, American Chemical Society (ACS) Meeting, Chicago (Aug 21–25, 2022); and Gordon Research Conference (GRC) on Water and Aqueous Solutions, Holderness, NH (July 25–29, 2022)
 18. Shi, M., et al., “Slippery Liquid-Infused Surfaces from Sand Dollars”, 2nd International Conference on Nature Inspired Surface Engineering (NISE-2022), Seoul National University, Seoul, South Korea (Aug 17–19, 2022)
 19. Mishra, H., “On the Formation of Hydrogen Peroxide in Water Microdroplets”, College of Chemistry, University of California Berkeley, Feb 10th, 2022 ([Invited Online Lecture](#)) Host: Prof. Richard Saykally.
 20. Mishra, H., “How Osmolytes Influence Electrostatics and Hydrophobic Surface Forces”, Surfaces, Interfaces and Coatings Technologies International Conference, Barcelona, Apr 27–29, 2022 ([Keynote](#))
 21. Mishra, H., “A Nature-inspired Solution for Reducing Post-Harvest Storage Loss in the Developing World”, 5th Edition of Global Virtual Conference on Food and Nutrition, Feb 14th, 2022 ([Invited](#))
 22. Maharjan et al., “How Osmolytes Influence Electrostatics and Hydrophobic Surface Forces”, Advances in surfaces, Interfaces, and Interphases (online, May 15–18, 2022)
 23. Mishra, H., “H₂O₂ production in Condensed Water Microdroplets: Facts and Artifacts”, Chemistry Department, University of California Merced, August 20, 2021 ([Invited online lecture](#))
 24. Arunachalam, S., et al., Diffusion-Driven Directional Wetting Transitions, American Physical Society (APS) Conference (2021)
 25. Arunachalam, S. et al., Durable Gas-Entrapping Microstructured Surfaces American Physical Society (APS) Conference (2021)
 26. Shi et al., “Unexpected Leidenfrost Behaviors on Doubly Reentrant Pillars and Cavities”, APS Fluid Dynamics Meeting (2021)
 27. Qiang, et al., “Polymer filaments from bouncing drop” APS Fluid Dynamics Meeting (2021)
 28. Zhang et al., “Trampolining Liquid Marbles”, 47th International Conference on Micro and Nano Engineering, Turin, Italy (Sept 21-23, 2021)
 29. H. Mishra, “On the Electrification of Water-Hydrophobe Interfaces”, College of Chemistry, University of California Berkeley, USA (Host: Prof. Richard Saykally; June 26th, 2020)
 30. H. Mishra, et al., “Exploring Fast Chemistries “On-Water”: Emulsions, Sprays, and the Air-Water Interface”, College of Chemistry, University of California Berkeley, CA, USA ([Invited Physical Chemistry Seminar](#), October 15th, 2019)
 31. H. Mishra, et al., “Exploring Fast Chemistries “On-Water”: Emulsions, Electrospays, and the Air-Water Interface”, Division of Chemistry and Chemical Engineering, California
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- Institute of Technology, Pasadena, CA, USA ([Invited Chemical Physics Seminar](#), October 8th, 2019)
32. H. Mishra et al., “Insect-inspired Translational Research”, NanoEngineering and Chemical Engineering Departments, University of California San Diego ([Special Seminar](#), Oct 4, 2019)
 33. H. Mishra et al., “Insect Inspiration: Fundamentals to Technologies”, Department of Chemistry and Biochemistry, University of Maryland ([Special Seminar](#), Oct 2, 2019)
 34. H. Mishra et al., “Are Electrospays Suitable for Investigating Chemistries at the Air-Water Interface?”, Gordon Research Conference on Liquids, Aug 5-9, 2019, Holderness, NH ([One of the eight posters selected from 150 poster-abstracts for 10-min talks](#))
 35. H. Mishra** et al., “Electrification at Water-hydrophobe Interfaces”, *Gordon Research Conference on Liquids*, New Hampshire, USA (Aug 5-9, 2019)
 36. *The 45th Micro and Nano Engineering Conference*, Sept 10, 2019 (Greece): Arunachalam, S., “Putting Cassie Under Pressure”; Das, R* et al., “Biomimetic architectures for entrapping air underwater using wetting materials”; Ahmad, Z., “Inexpensive and Scalable Perfluorocarbon-free Gas Entrapping Surfaces/Membranes” ([Best Poster Prize: Four posters recognized out of 404 entries](#))
 37. H. Mishra, et al., “On the Assessment of Omniphobicity Derived from Intrinsically Wetting Materials”, Poster presentation at the Heraeus Conference: Wetting on Soft or Microtextured Surfaces, Bad Honnef, Germany ([Session Chair](#), Apr 11-13, 2019).
 38. Nauruzbayeva, J. et al., “Nature-inspired Coating-free Membranes for Desalination”, 28th Annual Meeting of the North American Membrane Society (NAMS), May 11-15, 2019 (Pittsburgh, PA, USA)
 39. Das, R., “Bio-inspired Gas-entrapping Membranes (GEMs) for Coating-free Desalination”, 6th Nano Today Conference, June 16-20, 2019 (Lisbon, Portugal)
 40. 93rd ACS Colloid & Surface Science Symposium, Georgia Institute of Technology, June 16-19, 2019: Ghifari, M. G. et al., “Long-range attraction between glycine-coated mica surfaces in ultra-dilute electrolytes”; Pillai, S. et al., “Molecular Insights into the Loss of Hydrophobicity of Desalination Membranes by Amphiphilic Contaminants”
 41. Mishra, H. et al., “Hydrophobic Interactions Between Rigid Surfaces in Light and Heavy Water, Alcohols, and Various Electrolytes”, *XVI Surface Forces Conference*, Kazan, Russia (August, 2018)
 42. *Gordon Research Conference on Water and Aqueous Solutions*, New Hampshire, USA (July 25-29, 2018), entitled: Santana, A.** “Hydrophobic Interactions Between Rigid Surfaces in Light and Heavy Water”, Nauruzbayeva, J.** “Contact Electrification at Extended Interfaces of Water and Hydrophobic Materials”, Gallo, Jr., A.** “Chemistries in Electrospays Do Not Represent Those at the Air-Water Interface”, Ibrahim, M.** “Fries on-Water”, Pillai, S.** “Hydrophobic Interactions Between Rigid Surfaces in Non-Aqueous Systems”, Shrestha, B. R.** “Specific-ion Effects on Hydrophobic Interactions Between Rigid Surfaces”, Mishra, H.** “Biomimetic Coating-free Surfaces for Desalination”
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43. Mishra, H et al., "Coating-free Desalination Membranes from Mushroom-shaped Pores", *8th International Colloids Conference*, Shanghai, China ([Invited Showcase Oral presentation](#), June 2018)
 44. Gallo Jr., A. et al., "Inexpensive Superhydrophobic Sand Mulches for Dryland Agriculture", *255th American Chemical Society National Meeting and Expo*, New Orleans, USA (March, 2018)
 45. *International Congress and Expo on Agriculture & Horticulture 2018*, Amsterdam: Gallo Jr., A. "Superhydrophobic Sand Mulches Reduce Water Needs and Improve Yields in Desert Agriculture"; Odokonyero, K.** "Economical Analysis of Biochar Derived from Maize Straw for Use as Soil Amendment"; and Odokonyero, K.** "Paraffin Wax Coated Jute Bags Reduce Moisture-induced Food Grain Storage Loss"
 46. H. Mishra et al., "Bio-inspired Non-wetting Microtextures: Exploring New Avenues", *Living Light 2018*, Cambridge University, UK (March 11-14, 2018)
 47. H. Mishra et al., "Inexpensive Superhydrophobic Sand Mulches for Desert Agriculture", *7th International Colloids Conference*, Sitges, Barcelona, Spain (2017) ([Elsevier Best Poster Award](#))
 48. A. Gallo Jr., et al., "Superhydrophobic Sand Mulches", *5th Water Arabia Conference and Exhibition*, Al Khobar, Saudi Arabia (2017) ([First Prize, Doctoral Students Category](#))
 49. Shrestha, B. et al., "Surface Force Apparatus in Hydrophobic Interactions", *International Chemical Congress for Sustainable Development*, Nepal (2018) ([Young Scientist Award](#))
 50. Mishra, H. et al., Isotope Effects on Hydrophobic Interactions, *The 8th Biennial Australian Colloid and Interface Symposium*, Coffs Harbor, Australia (January 29-February 3, 2017)
 51. Mishra, H et al., "On Time-Dependent Filling of Doubly Reentrant Cavities", *EMN Meeting on Texture and Microtexture*", Hong Kong, (December, 2016) ([Invited talk](#))
 52. Mishra, H et al., "Mechanistic Insights into Acid-catalyzed Reactions 'On-water'", *International Conference on Science and Technology of Engineering Materials Pattaya*, Thailand (July, 2016) ([Best Presentation Award](#))
 53. Mishra, H et al., "The Hydrophobic Interaction: Effects of H-bonding Networks, Heavy vs Light Water, and Ions", *Conference on Ions in Solutions: Biology, Energy and Environment*, Telluride Science and Research Center, Colorado (July 11-17, 2016)
 54. Mishra, H et al., "Wetting of Surfaces with Reentrant and Doubly Reentrant Cavities", *6th International Colloids Conference*, Berlin (June 19-22, 2016)
 55. H. Mishra et al., "A predictive, unified model for contact angles for surfaces with reentrant features", *5th International Colloids Conference*, Amsterdam, The Netherlands (June, 2015)

BEFORE JOINING KAUST

56. H. Mishra et al., "Why is the air-water interface negatively charged?", *7th Annual Conference on the Physics, Chemistry and Biology of Water*, Vermont, USA (Oct. 2012) ([Gilbert Ling Prize](#))
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57. H. Mishra et al., Anions Dramatically Enhance Proton Transfer across Water Interfaces", *International Society for Theoretical Chemical Physics-VII*, Waseda, Japan, September, 2011 ([The Young Investigator Award](#))
58. H. Mishra et al., Boron-selective chelating resins from dendritic macromolecules, 9th Symposium on Nanotechnology and the Environment: Green Nanotechnology, *ACS National Meeting*, California, USA (March, 2011)
59. H. Mishra et al., Functional porous microspheres from hyperbranched polymers: synthesis, characterization and applications to boron removal from water, *NSF CMMI Research and Innovation Conference*, Georgia Institute of Technology, Atlanta, USA, Jan, 2011 ([NSF Travel Award](#))
60. H. Mishra et al., "Electrodeposition of bismuth telluride films onto carbon nanotube arrays", *Cooling Technologies Research Center Annual Meeting*, Purdue University, (Jun, 2008) ([Best Poster Award](#))
61. H. Mishra, "Applying projection theorem to an equilibrium equation", *Proceedings of the 10th Annual Conference on Mathematical Modeling organized by the Vijnāna Parishad of India*, National Institute of Technology, Bhopal, India (May, 2004) ([The Best Paper Award](#))

RESEARCH
SUPERVISION AT
KAUST

Primary Supervision - Masters	Primary Supervision – PhD	Post Doc Supervision
Completed: 8 In Progress: 7	Completed: 4 In Progress: 5	Total: 12 In progress: 2

PHD ADVISING

1. Dr. Adair Gallo Jr., Superhydrophobic Sand Mulches for Controlling Evaporative Losses in Aridland Agriculture: Fundamentals and Applications (2018–2021). Current position: CEO of Terraxy Inc., commercializing SandX and CarboSoil technologies.
2. Dr. Sreekiran Pillai, EnSE; Investigating hydrophobic interactions between extended surfaces (Aug, 2015 – Dec, 2019). Current position: Postdoctoral Scholar in the laboratory of Prof. Arun Kota at the North Carolina State University, USA
3. Dr. Jamilya Nauruzbayeva, EnSE; Contact electrification at water-hydrophobe interfaces: fundamentals and applications (2018–2022). Strategy & Marketing Analyst, Aramco, Dhahran, KSA
4. Sankara Arunachalam, EnSE; Bio-inspired gas-entrapping microtextures: fundamentals and applications (Fall 2020 – Fall 2023). Current position: Postdoc with Prof. Dan Daniels at KAUST. (**Dean's Award for Academic Excellence**). Current position: Postdoc at KAUST.
5. Yingfeng Xu, EnSE; Interactions between hydrophobic surfaces across water (Fall, 2021 – expected to finish in 2024)
6. Bob Vernooij, EnSE; Investigation of coastal, marine, and cosmopolitan Halobates insects in the Red Sea (Spring 2022–expected to finish in 2025)
7. Muzzamil Eatoo, EnSE; Electrochemistry in aqueous H₂O₂ solutions (Spring 2022 –)
8. Fabio Veiga de Camargo, EnSE; Precision open-field agriculture in KSA (Spring 2023–)
9. Batool Albar, EnSE; Engineered Biochar Formulations for Ultrahigh CEC, Slow N-Release, and Acidic pH for Soil Amendment, Fertility Enhancement, and Desert Rehabilitation

MS ADVISING

1. Aniela Zarzar Toraño, Chemical Science; Chemical surface modifications of silica for the removal of textile dyes in wastewater (Fall 2015 – Summer 2017). Current position: Reliability Engineer, Saudi Aramco, Dhahran, KSA.
2. Joel Reihmer, EnSE; Synthesis and characterization of hydrophobic granules and application in desert agriculture (Fall 2015 – Spring 2017). Current position: Chemist, Jim Bean, Kentucky, USA
3. Kuang-Hui Li, Materials Science; Surface functionalization of mica (Spring 2015 – Summer 2016). Current position: Research Engineer, TSMC, Taiwan.
4. Maria Fernanda Nava Ocampo, EnSE; Investigating effects of hypertonic saline solutions on lipid monolayers at the air-water interface as surrogates for lung surfaces (Fall 2015 – Summer 2017). Current position: Postdoc, KAUST.
5. Adair Gallo Jr, EnSE; An investigation of chemical landscapes in aqueous electrosprays by tracking oligomerization of isoprene (MS: Summer 2016 – Fall 2017). Current position: CEO, Terraxy Inc.
6. Muhammad Ghifari Ridwan, EnSE; Probing Slippery Liquid-infused Surfaces at the Nanoscale (Fall 2018 – Fall 2019; MS Student, WDRC, KAUST). Current position: Associate Manager, ACWA Power.
7. Zain Ahmad, EnSE; An experimental and theoretical investigation of pressure-induced wetting transitions, (Fall 2018 – Fall 2019). Current position: PhD student at Imperial College, London.
8. Abdulaziz A. Alruwaithi, Chemical Science; Investigating “On-water” Reactions using Microfluidics (Fall 2019 – Spring 2020). Current position: Business Analyst, Monz (Saudi Arabia).
9. Vinicius dos Santos, Chemical Science (Fall 2020 –2022) PhD student at KAUST
10. Nayara Musskopf, EnSE (Fall 2020 –) PhD student at KAUST (**Dean’s Award for Academic Excellence**)
11. Nischal Maharjan (Spring 2021–2023) PhD student at Georgia Tech, Atlanta
12. Abdul-Malik Ghoneim (Fall 2021–2023) ARAMCO – final stages
13. Lisa Exposito (Spring 2022–2023). Product Manager, Terraxy LLC
14. Batool Albar (Spring 2022–Fall 2023). PhD student in Interfacial Lab.
15. Amr Al-Zubi (Spring 2022– Summer 2023). PhD student at KAUST
16. Jiaqi Zheng (January 2023 –). PhD student at KAUST

POSTDOCTORAL SCHOLARS ADVISING

1. Dr. Andreia S. F. Farinha (2015-2016)
 - Current position/location: Director of Research in a start-up in Portugal.
2. Dr. Patricia Martins (2017-2018)
 - Current position/location: Scientist, Pharma company, Sweden
3. Dr. Cristina Chiutu (2015-2016)
 - Current position/location: Master Student in Robotics, University of Craiova

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4. Dr. Buddha Shrestha (2017-2021)
 - Current position/location: Researcher in Canada
 5. Dr. Adriano Sanchez (2017-2020)
 - Current position/location: Postdoctoral Fellow, WDRC, KAUST
 6. Dr. Ratul Das (2017-2020)
 - Current position/location: Senior Manager, ACWA Power R&D, Saudi Arabia
 7. Dr. Mahmoud Ibrahim (2018-2020)
 - Current position: Postdoc in France
 8. Dr. Meng Shi (2019- 2021)
 - Current position: Associate Professor at Xi'an Jiaotong University
<https://gr.xjtu.edu.cn/web/mengshi/home>
 9. Dr. Peng Zhang (2019 - 2021)
 - Current position: Research Scientist in my group.
 10. Dr. Kennedy Odokonyero (2018-2023)
 - Current position: Research Scientist in Mishra's group.
 11. Dr. Mohamed Subkhi Sadullah (2021 –)

RESEARCH SCIENTISTS

1. Dr. Peng Zhang (2021–2024)
 - Current position: Assistant Professor, Turin Polytechnic University (Applied Science and Engineering)

LAB TECHNICIANS

1. Dr. Eddy Domingues (June 2015-October 2017); Current position: Scientist, AFRY, Sweden
2. Dr. Navaladian Subramanian (October, 2015-2017). Current position: Entrepreneur
3. Mr. Sankara Arunachalam (2015 - 2020). Current position: Postdoctoral Scholar at KAUST
4. Mr. Edelberto Manalastas (2017 - 2021). Current position: Freelancer
5. Raymund Gestalta (2022–)
6. Amin Haider (2022–)
7. Elzain Hussein (2022–)
8. Ziad AlDawood (2023–)
9. Durga Prabhu (2023 –)

INTERNS WITH A GRADUATE DEGREE

1. AbdulAziz Sulemani, Summer 2022, Evaporation suppression in soils via SandX
2. Batool Albar (VSP), UC Davis (Fall 2021) Wax loading in SandX and biochar ion-exchange capacity characterization.
3. Olena Samonina (VSRP), National University of Kyiv-Mohyla Academy (2021) Collection and characterization of Halobates insects in and around KAUST mangroves.
4. Abdulmalik Al-Ghonaim (KAUST Gifted Students Program), MIT (June-August, 2020) Simulating interference in cavities comprising five optical layers.

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5. Nischal Maharjan (VSP) (2019) Functionalization of mica films prior to surface force measurements.
 6. Vinicius dos Santos (VSP) (2019) Greenhouse study of superhydrophobic sand on tomato plants.
 7. Nayara Musskopf (VSP) (2019) Spontaneous formation of H₂O₂ in water microdroplets.
 8. Muhammad G. Ridwan (VSP) (March-August, 2016) Water-flooding in calcite microchannels.
 9. Adair Gallo Jr. (VSRP) (2016) Superhydrophobic Sand.
 10. Dipti Raj (VSP), IIT Kharagpur (June-Aug, 2015) Wetting transitions on rough surfaces.
 11. Emilie Dauzon (VSP) (March-August, 2015) Electrification at solid-solid interfaces.
 12. Mohamed Ben Hsine (VSP), INSAT, Tunis (March-Aug, 2015) Filtration device from plant shoot.
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UNIVERSITY SERVICE

UNIVERSITY COMMITTEES

- Plant Growth Core Lab Steering Committee (2023–)
 - Student Recruitment Group (led by the KAUST Provost)
 - Search Committee Member for Plant Growth Facility Director
 - Official faculty mentor for Assistant Professors (Provost Office program)
 - Official faculty mentor for postdocs (VPR Office program)
 - KAUST President's Academic Council (2019 - 2020)
 - Admissions Committee Chairperson, EnSE Program (2017 - 2021)
 - Representative of the Biological and Environmental Science and Engineering Division for the Faculty Learning Program (FLP), Berkeley Center for Teaching and Learning, University of California Berkeley (August 2018)
 - Faculty Committee Member: Plant Growth Core Lab (2019- 2021); Nanofabrication Core Lab, KAUST (2018- 2020); Analytical Core Lab, KAUST (2016-2018)
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PUBLIC OUTREACH ACTIVITIES

1. Interview in Saudi-Brazilian platform: <https://anba.com.br/en/brazilian-indian-run-innovative-saudi-based-agtech/>
 2. Invited Delegate to COP-28 and the Saudi Green Initiative Forum, Dubai (December 2023)
 3. Invited Speaker, Saudi British Joint Business Council (SBJBC), Host: CCRC, KAUST (Nov. 29, 2023)
 4. Distinguished Speaker, 2023 Thriving Together Conference by Saudi Youth for Sustainability, KAUST (October 18, 2023)
 5. Invited delegate to NEOM (Environment, Food, & Nature Conservation Sectors), Nov 2023, accompanied by Dr. Lukas van Zwieten.
 6. SIRC Delegate to Tanmiah Food Company, Hail, and Jwain Factory, Al-Qassim (Oct, 2023)
 7. Hosted a NEOM delegation (Food and Nature Conservation Sectors) at KAUST (Apr, 2023)
 8. SandX demonstration at The KAUST School via Center for Desert Agriculture (Mar 2023)
 9. SandX demonstration at Saudi International Golf Tournament at King Abdullah Economic City (KAEC) February 2022
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10. Speaker and panelist at KAUST Gifted Student Program (KGSP) recruitment event (Jan 14–15, 2022)
 11. Invited Speaker, King Abdulaziz City for Science and Technology (KACST) Webinar on Saudi Green Initiative (Dec 14, 2021) – one among selected speakers from KAUST, Caltech, and UC Berkeley.
 12. Invited Speaker, Saudi Aramco Webinar on Saudi Green Initiative (Dec 5, 2021)
 13. SandX demonstration at KAUST Research Open Week (Nov. 28, 2021):
 14. Speaker at Visiting Student Internship recruitment event (Nov. 12, 2021)
 15. Developed an internship program for the KAUST School (TKS) students (Fall, 2020).
 16. The KAUST School Curriculum Committee (2019 - present); speaker at The KAUST School
 17. Lecture on (and demo of) Superhydrophobic Sand (SHS) technology at the Global Forum for Innovators in Agriculture (GFIA), Abu Dhabi (Apr 1-2, 2019)
 18. Panel Discussions:
 - a. KAUST Sci Café on Water Security (March 8, 2019).
<https://www.youtube.com/watch?v=Zgn8kiRVAqQ&t=122s>
 - b. Lecturer and panelist at the United Nations' COP-24 Conference, Katowice, Poland (Dec 5, 2018): <https://www.facebook.com/watch/?v=715664815547200>
 19. Nature Research Chemistry Community Blogs:
 20. <https://chemistrycommunity.nature.com/users/174953-himanshu-mishra/posts/44910-calling-on-to-women-meches>
 21. <https://chemistrycommunity.nature.com/users/174953-himanshu-mishra/posts/38606-our-journey-towards-coating-free-liquid-repellent-surfaces>
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PROFESSIONAL SERVICE

Organizer of the International Conference on Physics and Chemistries at Hydrophobic Interfaces at KAUST during February 14-17, 2016 (US \$ 150,000 award from the Office of Sponsored Research)

REVIEWERSHIP FOR JOURNALS

Nature Reviews Chemistry, Nature Communications, Proceedings of the National Academy of Sciences of the USA, Journal of the American Chemical Society, Chemical Science, Advanced Functional Materials, Advanced Materials Interfaces, Scientific Reports, Langmuir, Analyst, Journal of Colloid and Interface Science, Petroleum Science, Chemical Engineering Science, Journal of Physical Chemistry Letters, International Journal of Heat and Mass Transfer, Frontiers in Mechanical Engineering.

REFERENCES

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