

Razan O. Nughays

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PROFILE

An experienced researcher in Ultrafast Scanning Electron Microscopy (U-SEM) for charge carrier studies, committed to interdisciplinary research in materials science for sustainable technologies, with a strong focus on problem-solving and collaboration. .

EDUCATION

Ph.D. in Material Science and Engineering

King Abdullah University of Science and Technology (KAUST)

Thuwal, Saudi Arabia

Summer 2020- Fall 2025

M.Sc. in Material Science and Engineering

King Abdullah University of Science and Technology (KAUST)

Thuwal, Saudi Arabia

Fall 2018- Summer 2020

B.Sc. in General Physics

King Abdulaziz University (KAU)

Jeddah, Saudi Arabia

Fall 2013- Spring 2017

RESEARCH & TEACHING EXPERIENCE

Postdoctoral in Chemical Engineering

MIT, Prof. William Tisdale

Boston, United States

Fall 2026- Present

- Leveraging novel ultrafast microscopy to study complex materials.

Ph.D. student

KAUST, Prof. OMAR F. MOHAMMED

Saudi Arabia

Summer 2020-Fall 2025

- Utilizing USEM to study the ultrafast dynamics of charge carriers at the first few nanometers of perovskite single crystals with emphasis on understanding ion migration and surface defects.
- Investigating surface chemistry and structure influence on carriers mobility in order to develop high-efficiency photovoltaic devices by improving surface design.

Mentor

KAUST Academy Summer Internship Program

Saudi Arabia

Summer 2025

- Mentoring two students from KAUST Academy in a research-based summer internship.
- Guiding them through lab work, data interpretation, and scientific communication.
- Designed supplementary training sessions and assigned literature to introduce them to advanced research topics in materials science and ultrafast characterization.

Teaching Assistant (TA)

KAUST, Materials Characterization (MSE 228)

Saudi Arabia

Spring 2025

Traveling scholar/Internship

University of California Santa Barbra (UCSB), Prof. Bolin Liao

United States

Summer 2024

- Tracking thermal effects on backscattered electron diffraction (BSED) pattern in silicon using modified direct detector in SEM.
- Examining the optical response of Sodium ions (Na^+) in solid-state ion batteries.

Teaching Assistant (TA)

KAUST, Materials Characterization (MSE 228)

Saudi Arabia

Spring 2024

Directed research

Saudi Arabia

- Synthesis of a hydrogel MXene for a self-healing material used in sensing application and testing its mechanical properties.

Directed research

Saudi Arabia

KAUST, Prof. PEDRO M. DA COSTA

Summer 2019

- Transfer graphene efficiently to suitable substrates to enhance its performance.

PUBLICATIONS

1. R. O. Nughays, C. Xing, G. Deokar, N. Wehbe, Y. Zhang, P. Maity, S. Nematullov, L. Gutiérrez-Arzaluz, A. M. El-Zohry, S. Zhang, J. Li, X. Fu, J. Zhao, Visualizing and Modulating the Surface Carrier Dynamics of Tellurium–Selenium Nanocomposites, *The Journal of Physical Chemistry C*, 2025.
2. R. Gnabasik, R. O. Nughays, A. Overholser, V. Kumar, S. Adajian, N. Ventura, D. S. Gianola, B. Liao, Fast nanothermometry based on direct electron detection of electron backscattering diffraction patterns, *Physical Review Applied*, 2025.
3. L. Wang, R. O. Nughays, O. F. Mohammed, Spatiotemporal Imaging of Photogenerated Charge Carriers in Optoelectronic Materials, *Matter*, 2025.
4. L. Wang, W. Wu, J. Yang, R. O. Nughays, Y. Zhou, E. Ugur, X. Zhang, B. Shao, J. Wang, J. Yin, S. D. Wolf, O. M. Bakr, O. F. Mohammed, Real-space imaging of photo-generated surface carrier transport in 2D perovskites. *Light Science & Application*, 14, 124, 2025
5. S. Nematullov, R. O. Nughays, S. Nematullov, S. Thomas, D. R. Naphade, T. Anthopoulos, O. M. Bakr, H. N. Alshareef, O. F. Mohammed, Nature of the carrier dynamics and contrast formation on the photoactive material surfaces: Insight from ultrafast imaging to DFT calculations, *The Journal of Chemical Physics*, 2024, 161 (23): 234702.
6. R. O. Nughays, K. Almasabi, S. Nematullov, L. Wang, T. Bian, I. Nadinov, B. Irziqat, G. T. Harrison, Shadi Fatayer, Jun Yin, O. M. Bakr, O. F. Mohammed, Mapping Surface-Defect and Ions Migration in Mixed-Cation Perovskite Crystals, *Advanced Science*, 2024, (11), 2404468.
7. L. Wang, R. O. Nughays, J. Yin, C. Shih, T. Guo, O. F. Mohammed, M. Chergui, Band Gap Renormalization at Different Symmetry Points in Perovskites, *ACS Photonics*, 2024, 11(6), 2273-2281.
8. L. Wang, R. O. Nughays, T. C. Rossi, M. Oppermann, W. Ogieglo, T. Bian, C. Shih, T. Guo, I. Pinnau, J. Yin, O. M. Bakr and O. F. Mohammed, M. Chergui, Disentangling Thermal from Electronic Contributions in the Spectral Response of Photoexcited Perovskite Materials, *Journal of the American Chemical Society*, 2024, 146 (8), 5393-5401.
9. L. Wang, R. O. Nughays, X. Song, T. Bian, M. Nejib Hedhili, J. Yin, O. M. Bakr, O. F. Mohammed, Crystallographic orientation-dependent photo-response of planar cadmium telluride X-ray detectors, *Cell Reports Physical Science*, 2023, 4(12), 101723.
10. L. Wang, H. Wang, R. O. Nughays, W. Ogieglo, J. Yin, L. Gutiérrez-Arzaluz, X. Zhang, J. Wang, I. Pinnau, O. M. Bakr, O. F. Mohammed, Phonon-driven transient bandgap renormalization in perovskite single crystals, *Materials Horizons*, 2023, 10 (10), 4192-4201.

11. R. O. Nughays, C. Yang, S. Nematulloev, J. Yin, G. T. Harrison, J. Zhao, S. Fatayer, O. M. Bakr, O. F. Mohammed, Visualization of Surface Charge Carrier Diffusion Lengths in Different Perovskite Crystal Orientations Using 4D Electron Imaging, *Advanced Optical Materials*, 2023, (11),2300190.
12. J. Zhao, R. O. Nughays, O. M. Bakr, O. F. Mohammed, Access to Ultrafast Surface and Interface Carrier Dynamics Simultaneously in Space and Time, *The Journal of Physical Chemistry C*, 2021, 125 (27), 14495-14516.

CONFERENCES

Future of Semiconductors Forum 2025 <i>Attendee</i>	Saudi Arabia, KAUST <i>May 2025</i>
MRS Fall Meeting <i>Participant: Oral presentation</i>	United State, Boston <i>December 2024</i>
KAUST Workshop: Photovoltaic Innovation in Saudi Arabia <i>Participant: Poster presentation</i>	Saudi Arabia, KAUST <i>April 2024</i>
ACWA Power KAUST innovation days <i>Participant: Poster presentation</i>	Saudi Arabia, KAUST <i>January 2024</i>
IMC20 Conference <i>Participant: Poster presentation</i>	South Korea, Busan <i>September 2023</i>
Future of Semiconductors Conference <i>Attendee</i>	Saudi Arabia, KAUST <i>May 2023</i>
Advanced Membrane and Porous Materials Conference <i>Volunteer and Attendee</i>	Saudi Arabia, KAUST <i>March 2023</i>
SPIE conference <i>Participant: Poster presentation</i>	United States, San Francisco <i>January 2023</i>
KAUST Career Fair <i>Volunteer</i>	Saudi Arabia, KAUST <i>June 2022</i>

AWARDS & RECOGNITION

- Ibn Khaldun Postdoctoral Fellowship 2025
- KAUST Dean's Award 2023-2024
- IMC20 Conference: Best Poster Presentation Award 2023
- KAU Certificate of excellence 2014-2017

TECHNICAL SKILLS

- **Programming:** Python, MATLAB, LaTeX
- **Data Analysis Tools:** Origin, MS Excel
- **Laboratory Techniques:** Femtosecond fiber laser maintenance, optical alignment.