Tarek Abdul Fattah | PhD, MSc, BE

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I worked as postdoctoral research associate (PDRA) in the Electronic and interface materials group in the department of materials at University of Oxford working on the design of charged oxide inversion layer (COIL) solar cell. I also taught undergraduate and postgraduate mechanical engineering courses at two Lebanese universities. I completed a mechanical engineering undergraduate degree with 3.95 GPA and my MSc in Renewable Energy and Clean Technology at the University of Manchester as the top student. I was awarded a departmental success scholarship to fund my PhD focusing on the identification and characterization of defects causing degradation in silicon solar cells. I have published several studies in peer-reviewed journals and delivered presentations in international conferences. I have been involved in many teaching activities (lectures, lab demonstrations, supervision, etc).

Publications

- **Peer review articles:**

1. Niu, Xinya; **Abdul-Fattah, Tarek** *et al.,* "Thermally Driven Area-Selective Deposition Enabling Direct-Write Thin Films", ACS Applied Materials & Interfaces, Submitted, 2026.
2. Theodore D. C. Hobson, **Tarek Abdul Fattah** et al., "Annealing-driven hydrogen migration to elucidate interfacial passivation in indium-free AZO contacts on n-type silicon", ACS Applied Materials & Interfaces, Submitted, 2026.
3. Jingyan Chen, **T. O. A. Fattah** *et al.*, " Enabling highly conductive charged oxide inversion layers through hot corona discharge", *Solar Energy Materials and Solar Cells*, vol. 295, 2026, https://doi.org/10.1016/j.solmat.2025.113930.
4. **T. O. Abdul Fattah** *et al.*, "Nanosecond vs Picosecond: The Potential for Advanced Solar Cell Processing via Pulsed Laser Technology, Journal of Applied physics, vol. 138, no. 8, p. 083108, 2025, https://doi.org/10.1063/5.0284270.
5. Yuelin Xiong, **Tarek O. Abdul Fattah**, Kuninori Okamoto, Ruy S. Bonilla, "A Failure Mode Affecting the Reliability of LECO-Treated High-Efficiency TOPCon Solar Cells", Solar RRL, p. 202500151, 2025, https://doi.org/10.1002/solr.202500151
6. **T. O. A. Fattah** *el al.*, "Determination of Gallium Concentration in Silicon from Low-temperature Photoluminescence Analysis", Solar RRL, vol. 8, no. 4, p. 2300956, 2023, https://doi.org/10.1002/solr.202300956.
7. J. Coutinho, D. Gomes, V. J. B. Torres, **T. O. A. Fattah**, V. P. Markevich, and A. R. Peaker, "Hydrogen reactions with dopants and impurities in solar silicon from first principles", Solar RRL, vol. 8, no. 2, p. 2300639, 2023, https://doi.org/10.1002/solr.202300639.
8. **T. O. A. Fattah** *et al.*, "High-resolution photoluminescence study on donor-acceptor pair (DAP) recombination in silicon crystals co-doped with phosphorous and gallium," *Journal of Science: Advanced Materials and Devices,* vol. 8, no. 4, p. 100629, 2023, https://doi.org/10.1016/j.jsamd.2023.100629.
9. J. Coutinho, D. Gomes, V. J. B. Torres, **T. O. A. Fattah**, V. P. Markevich, and A. R. Peaker, "Theory of reactions between hydrogen and group-III acceptors in silicon," *Physical Review B,* vol. 108, no. 1, p. 014111, 2023, https://doi.org/10.1103/PhysRevB.108.014111.

10. **T. O. A. Fattah** *et al.*, "Interactions of hydrogen atoms with boron and gallium in silicon crystals co-doped with phosphorus and acceptors," *Solar Energy Materials and Solar Cells,* vol. 259, p. 112447, 2023, https://doi.org/10.1016/j.solmat.2023.112447.
11. **T. O. Abdul Fattah** *et al.*, "Interactions of Hydrogen Atoms with Acceptor–Dioxygen Complexes in Czochralski-Grown Silicon," *Physica Status Solidi A,* p. 2200176, 2022, https://doi.org/10.1002/pssa.202200176 .
12. A. R. Meyer, **T.O. Abdul Fattah** *et al.*, "Spectroscopic Investigation of Shallow Hole Traps in Ga-and B-doped Czochralski Silicon: Insight into Light-Induced Degradation," *ACS Applied Energy Materials,* vol. 5, no. 11, pp. 13161-13165, 2022, https://doi.org/10.1021/acsaem.2c02852.

- **Conference papers:**

1. **T. O. Abdul Fattah** *et al.*, "Minority Carrier Trapping Effects in mono-crystalline Silicon," proceedings of the *40th European Photovoltaic Solar Energy Conference and Exhibition,* 2023, https://doi.org/10.4229/EUPVSEC2023/1BV.5.12.
2. **T. O. Abdul Fattah** *et al.*, "Analysis of Impurity-related Radiative Transitions in Silicon Materials using Temperature-dependent Photoluminescence," proceedings of the *50th IEEE Photovoltaic Specialists Conference,* 2023. https://doi.org/10.1109/PVSC48320.2023.10359855
3. **T. O. A. Fattah** *et al.*, "Deep-level defects in Ga-doped silicon crystals," 2023, vol. 2826: AIP Publishing, https://doi.org/10.1063/5.0140826.

Education and Qualifications

- **PhD, University of Manchester, UK:** January 2021- March 2024
  - My PhD aimed at understanding the defects limiting the efficiency of silicon solar cells via optical ana electrical characterization techniques.
  - Some major achievements include:
    - I revealed the mechanism behind the regeneration of boron-oxygen light-induced degradation (LID).
    - I was first to propose the involvement of H_2 in the defect(s) causing LeTID. Based on this proposal, collaborations with University of Konstanz and University of Freiburg in Germany were established.
    - I co-authored work related to the understanding of the hydrogen dynamics in n-type and p-type Si and its relation to degradation mechanisms.
  - I was able to use higher-resolution PL to understand fundamental properties of dopants in Si.
  - I lead lab teaching activities of several units in the EEE and MACE departments at UoM.
- **MSc, University of Manchester, UK (Distinction, Top student):** September, 2019 – September, 2020
  - I studied Renewable Energy and Clean Technology course consisting of units related to all energy sources as well as energy system considerations such as zero carbon-built infrastructure.
  - I was involved in group- and individual-based projects including metal electrodes formation of solar cells in cleanroom facilities, future energy mix scenarios, turbine aerofoil design simulations, etc…
  - I developed great insights into key topics such as: working principles of solar PV technology; the role renewable energy in the future energy mix; fast evolving trends in renewable energy technologies.
- **BE Mechanical Eng., Beirut Arab University, Lebanon (GPA 3.95/4):** September, 2015 – June, 2019
  - I learned about the fields of thermodynamics, fluid mechanics, heating systems, air conditioning, etc…
  - More than **90%** of all courses passed with **A/A+ grade**.
  - I completed different trainings and internships in areas related to mechanical engineering systems.

Work Experience and Internships

- **Assistant Professor, Beirut Arab University, Lebanon:** September, 2026- Current
  - I'm a part of renewable energy engineering program. I design and teach different courses including first year general engineering courses (e.g. dynamics), 2nd-3rd year fundamental courses (e.g.

thermodynamics) and final year technical courses (e.g. wind energy)
    - My work includes developing syllabus, course material, examination schemes and exams.
- **Lecturer (part-time), Beirut Arab University, Lebanon:** January, 2026-June 2026
    - I designed and taught a full fourth year course to renewable energy engineering students from scratch including the preparation of syllabus, course material and examination schemes.
    - Delivered a first-year physics course to general engineering students.
- **Lecturer (part-time), Lebanese International University, Lebanon:** September, 2025-June 2026
    - I was responsible for the following courses: thermodynamics, fluid mechanics I and heat transfer for 2nd and 3rd year mechanical engineering students. I was also the instructor for the advanced heat transfer course for masters students.
- **Postdoctoral Research Associate, University of Oxford, UK:** April, 2024-August 2025
    - I worked on the development of an efficient inversion layer solar cell. This involves the optimisation of many different processes including laser doping, corona discharge to charge oxide, electroplating, dielectric layers deposition and characterization, etc… all optimised for this novel design.
    - I was involved in the supervision of one part-II and two PhD students as well as the marking of scripts for the British Physics Olympiad.
- **Graduate Teaching Assistant, University of Manchester, UK:** January, 2021-March, 2024
    - I was involved in lecture delivery for undergraduate and postgrad level students, exam correction and lab demonstration in many electrical and electronic engineering units. The role included the communication with unit leaders, coordination with the EEE department operations team as well as direct interaction with students.
- **Intern, Solar Wind Middle East SARL, Lebanon:** April, 2019 – July, 2019
    - I Completed the solar PV Installation and maintenance training course delivered by Institut européen de coopération et de développement (IECD). I was a part of a team responsible for the installation of an east-west configuration 1MW three-phase PV system for a factory.
- **Intern, Khatib&Alami Consolidated Engineering Company SAL:** July, 2018 – August, 2018
    - Went through different mechanical engineering subjects including HVAC designing and piping, duct work, water supply and drainage, firefighting system, etc… under the supervision of experienced engineers.

Personal achievements and gains

- I won best abstract or poster in several conferences and presented my work in the highlight session.
- I managed to secure funding for my travel to international conferences from Supergen SuperSolar hub, UK.
- I designed and led the lab activities for the solar PV technologies MSc unit in the University of Manchester and trained fellow PhD students for several years.
- I was the top student in my cohort during my undergraduate and my MSc studies.
- I volunteered in organizing several conferences including “siliconPV2025” and “Advanced Electronics and Photonics Materials 2022”.
- I took responsibility for creating risk assessments and COSHH statements for key cleanroom processes.
- I used cleanroom facilities to process samples for experimental measurements via many techniques including photolithography, plasma sputtering/diffusion, ALD, electroplating, laser doping, PL imaging, etc.
- I gained deep knowledge in the field of defect engineering/characterization in semiconductors via junction spectroscopy techniques by working closely with a research team (with more than 3 decades of experience).
- I expanded my knowledge on semiconductor characterization methods further by extensively working and interacting with members in oxford doing work on surface passivation layers of solar cells.
- I gained valuable insights into the pressure of academic life by interacting with department operations team, unit leaders and supervisory team and undertaking many relevant trainings.
- I helped set marking schemes, evaluated lab scripts of different types and provided feedback to students.
- I worked collaboratively with scientists, physicists and engineers from NREL (USA), University of Aveiro (Portugal), University of Konstanz and Freiburg (Germany) and even companies like Trina Solar.

- I assembled and commissioned a low-temperature PL system from scratch including the optical parts, lasers, cryostat, monochromator and conducted necessary alignment, calibration and testing of the system.
- I was involved in the preparation of all aspects of publications including literature review, experimental design, methodology, data curation and analysis, writing the first drafts, editing and submission.

Additional relevant skills

- **Computer skills:** Microsoft Office package, OriginPro, AutoCAD
- **Languages:** Fluent in English and Arabic (writing, reading and speaking)
- **Personal Skills:** Leadership, time management, resilience, fast learner, team building, problem solving.
- **Interest and hobbies:** acquiring knowledge, volunteering, travelling, competing, and exercising.

List of conference presentations

- **15th International Conference on Silicon Photovoltaics (siliconPV2025):** Nanosecond vs Picosecond: The Potential for Advanced Solar Cell Processing via Pulse Laser Technology (Poster-best poster award)
- **40th European Photovoltaic Solar Energy Conference & Exhibition (EU PVSEC-2023):** Minority carrier trapping effects in mono-crystalline silicon (Poster)
- **17th Photovoltaic Science, Applications and Technology Conference (PVSAT-17):** Recombination Processes associated with Oxygen-related Thermal Donors in n-type Czochralski-grown Silicon (Oral)
- **13th International Conference on Silicon Photovoltaics (siliconPV2023):** Interactions of Hydrogen Atoms with Boron and Gallium in Cz-grown Si Crystals co-doped with Phosphorus and Acceptors (Oral-best abstract award, highlight session)
- **12th International Conference on Silicon Photovoltaics (siliconPV2022):** Deep-Level Defects in Ga-doped Silicon Crystals (Oral)
- **50th IEEE Photovoltaic Specialists Conference (PVSC-50):** Analysis of Impurity-related Radiative Transitions in Silicon Materials using Temperature-dependent Photoluminescence (Poster)
- **19th Conference on Gettering and Defect Engineering in Semiconductor Technology (GADEST-19):** Interactions of Hydrogen Atoms with Acceptor-dioxygen Complexes in Czochralski-grown Silicon
- **16th Photovoltaic Science, Applications and Technology Conference (PVSAT-16):** Comparison of Deep Level Defects in Boron- and Gallium-doped Czochralski-grown Silicon Crystals (Oral)

References available upon request.