

Ibrahim Abdelwahab, Ph.D.

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RESEARCH & TEACHING INTERESTS

Materials scientist working in the area of nanotechnology and nanophotonics. In particular, my research focuses on near-field optical nanoscopy, nonlinear nano-optics, and spin-orbitronics. Additional research and teaching interests include high-throughput computational and experimental approaches in predicting, synthesizing, and characterizing new quantum materials with novel or enhanced properties. Author of 42 peer-reviewed journal publications, including 12 as first author.

RESEARCH EXPERIENCE

- 2022-** **Research Associate in Cryogenic Nanoscopy**, Center for Nanoscale Systems (CNS), Faculty of Arts and Sciences, Harvard University, Cambridge, MA, USA
Faculty Advisor: William L. Wilson, Executive Director of Harvard CNS
Project: Near-field optical nanoimaging and nanospectroscopy at cryogenic temperatures
- 2020-22** **Alexander von Humboldt Postdoctoral Fellow in Nonlinear Nano-optics**, Chair in Hybrid Nanosystems, Nano-Institute Munich, Faculty of Physics, LMU Munich, Germany
Faculty Advisor: Stefan A. Maier, Head of the School of Physics and Astronomy, Monash University
Project: Nonlinear optics with 2D layered materials
- 2019-20** **Postdoctoral Fellow in Spin-orbitronics**, Department of Chemistry, Faculty of Science, National University of Singapore (NUS), Singapore
Faculty Advisor: Kian Ping Loh, Professor of Chemistry at NUS
Project: Unconventional spin-orbit coupling in chiral and topological materials

EDUCATION

- 2019** **Joint Ph.D. in Physics**, Imperial College London & National University of Singapore
Thesis: Linear and Nonlinear Optical Studies of Two-Dimensional Perovskites
Faculty Advisor: Stefan A. Maier & Kian Ping Loh
- 2013** **M.S. in Nanoscience**, Lund University, Sweden
Thesis: Ultra-Bright Electron Sources Based on Millimeter Long Carbon Nanotubes
Faculty Advisor: Mauricio Terrones (Penn State)
- 2009** **B.S. (Hons) in Applied Chemistry**, Helwan University, Egypt

PUBLICATIONS

>40 Peer Reviewed Archival Journal Publications in top-tier scientific journals, including *Science*, *Nature Photonics*, *Nature Materials*, *Nature Chemistry*, *Nature Communications*, *Science Advances*, *Advanced Materials*, *JACS*, *ACS Nano*, *Nano Letters*, etc.

» For a full list of my publications, please refer to my Google Scholar and ORCID pages:

- [Google Scholar](#): h-index 29, >3,700 citations

Selected first-author publications

1. **Ibrahim Abdelwahab** et al. "Two-dimensional chiral perovskites with large spin Hall angle and collinear spin Hall conductivity," *Science* 385, 311 (2024)
2. **Ibrahim Abdelwahab**, et. al. "Highly Efficient Sum-Frequency Generation in Niobium Oxydichloride NbOCl₂ Nanosheets," *Advanced Optical Materials* 11, 2202833 (2023)
3. **Ibrahim Abdelwahab** et. al. "Giant second-harmonic generation in ferroelectric NbOI₂," *Nature Photonics* 16, 644 (2022)
4. **Ibrahim Abdelwahab** et. al. "Data-driven Discovery of High Performance Piezoelectric 2D NbOI₂," *Nature Communications* 13, 1884, (2022)
5. **Ibrahim Abdelwahab** et. al. "Giant and Tunable Optical Nonlinearity in Single-crystalline 2D Perovskites due to Excitonic and Plasma Effects," *Advanced Materials* 31, 1902685 (2019)
6. **Ibrahim Abdelwahab** et. al. "Molecularly thin two-dimensional hybrid perovskites with tunable optoelectronic properties due to reversible surface relaxation," *Nature Materials* 17, 908 (2018)
7. **Ibrahim Abdelwahab** et. al. "Highly enhanced Third Harmonic Generation in 2D Perovskites at Excitonic Resonances," *ACS Nano* 12, 644 (2018)

HONOURS & AWARDS

Scholarships & Fellowships

Harvard CNS Scholar, The National Nanotechnology Coordinated Infrastructure (NNCI), 2022
Humboldt Research Fellowship for postdoctoral researchers, Alexander von Humboldt Foundation, 2020
NUS-Berkeley Exchange Scholar Program Scholarship, Berkeley Education Alliance for Research in Singapore (BEARS) Center, CREATE, 2017
Joint Imperial College–NUS Ph.D. Scholarship, Imperial College & NGS/NUS, 2015
The French CEA Scholarship, The French Atomic Energy Commission (CEA), 2014
K.U.Leuven Scholarship, Katholieke Universiteit Leuven (KU Leuven), 2013
Blaise Pascal University M2 Scholarship, Blaise Pascal University, 2011
Erasmus Mundus Master's Scholarship, European Union, 2010

Academic Recognition

Certificates of Recognition for Peer Review Activities (23 reviews), *ACS*, *Wiley*, and *Elsevier*, 2017-24
Team Coach for the Neuro-inspired Computing Team at the Merck Innovation Cup, The Merck Group, 2024
Research highlights "Ferroelectric Nanosheets Boost Nonlinearity," *Nature Photonics* 16, 611 (2022).
The 71st Lindau Nobel Laureate Meeting, The Council for the Lindau Nobel Laureate Meetings, 2022
JSPS HOPE Fellow, Japan Society for the Promotion of Science (JSPS), 2022
UK Global Talent Immigrant, The Royal Society & UK Home Office, 2022
Innovators Under 35 MENA, MIT Technology Review, 2021
ESSP Shield of Excellence and Certificate of Merit, ESSP, 2009

Research Grants

National Nanotechnology Coordinated Infrastructure (NNCI) funding, The National Science Foundation (NSF), 2022, \$200k
Approved CNMS Proposal, Oak Ridge National Laboratory (ORNL), DOE Office of Science, 2025

Travel awards

Travel Grants for Early-Stage Researchers, NUS, 2016, \$20k
The grants supported research visits to LMU Munich (Germany, 2019), Technical University of Munich (Germany, 2018), neaspec GmbH (Germany, 2017), Anasys Instruments (USA, 2017), Molecular Vista (USA, 2017), and Swinburne University of Technology (Australia, 2016).

PRESENTATIONS

> 30 Attended International Conferences and Workshops

Invited Lectures

- “Advanced characterization methods for ultrathin materials” Precision in Two Dimensions: Quantum Materials Characterization Workshop, Harvard University, December 6, 2024 (Organizer: David C. Bell)
- “Scattering-type scanning near-field optical microscopy (s-SNOM),” Harvard CNS Imaging and Materials group summer seminar series, August 23, 2023 (Organizer: Arthur McClelland)
- “2D materials with unique order parameters,” MIT Department of Materials Science and Engineering, August 2, 2023 (Host: Iwnetim Abate)
- “Nonlinear optics with 2D layered materials,” Walter Schottky Institute, Technical University of Munich, October 4, 2021 (Host: Alexander Holleitner)
- “Layered materials and heterostructures” Online talk, Cambridge Graphene Centre, April 22, 2021 (Host: Andrea C. Ferrari)
- “2D Materials: Science and Technology” Online talk, ETH Zurich, March 26, 2021 (Host: Steven Johnson)
- “Characterizing 2D materials with nanoscale IR spectroscopy and imaging,” 2nd ISMI Workshop Focus on nanoIR3 and mIRage, Singapore, November 19, 2019 (Organizer: Mark Breese)

Conference Talks

- “Nonlinear optical responses of 2D hybrid perovskites,” The 10th International Conference on Materials for Advanced Technologies (ICMAT 2019), Singapore, June 23-28, 2019
- “Black phosphorus devices with high mobility and air stability,” The 9th Electronic Structure and Processes at Molecular-Based Interfaces (ESPMI 9), Singapore, November 8-10, 2017
- “Nonvolatile memories for high-density data storage,” The 16th Colloque Louis Néel, Autrans, France, September 23-26, 2014
- “Zero-dimensional phase change memory,” European Phase Change and Ovonic Symposium (EPCOS 2014), Marseille, France, September 7-9, 2014

Posters and abstracts

- “New promising materials for efficient nonlinear and ultrafast nanophotonics,” The 10th International Conference on Advanced Materials & Nanotechnology (AMN10), Rotorua, New Zealand, 2023.
- “Giant and tunable optical nonlinearity in single-crystalline 2D perovskites due to excitonic and plasma Effects,” Frontiers in Optics + Laser Science, Washington, DC, USA, 2019.
- “Anisotropic Kerr nonlinearity of lithium hydride intercalated black phosphorus,” ICON-2DMAT, Melbourne, Australia, 2018.
- “On the quest for high-efficiency third-harmonic generation on the nanoscale,” PIERS, Toyama, Japan, 2018.
- “Chemical stabilization of 1T’ phase transition metal dichalcogenides,” The 2017 MRS Fall Meeting & Exhibit, Boston, MA, USA, 2017.
- “Optical properties of 2D perovskites,” ICMAT 2017, Singapore, 2017.
- “Size misfit and elastic energy contribution to the phase transition of PCM clusters,” EPCOS, Marseille, France, 2014.

Nobel Laureate Meetings

- The Global Young Scientists Summit 2022. Singapore, January 17-21, 2022
- The 13th HOPE Meeting. Tokyo, Japan, March 7-11, 2022
- The 71st Lindau Nobel Laureate Meeting. Lindau, Germany, June 26-July 1, 2022

TEACHING & ADVISING EXPERIENCE

Teaching Assistant

Responsibilities included developing new class materials, leading class discussions, supervising labs, grading all assignments, and meeting with students individually. Overall feedback rating of ≥ 4.5 (5 points rating).

- Microfabrication Laboratory (Spring 2025), Harvard SEAS.
- Introduction to Microelectromechanical Systems (Fall 2023), Harvard SEAS. 13 undergraduates and graduates.
- General and Physical Chemistry for Engineers (Spring 2016), National University of Singapore. 317 undergraduates
- Organic Chemistry for Engineers (Fall 2015 and 2016), National University of Singapore. 300 undergraduates
- Spectroscopy & Spectrometry (Spring 2010), Helwan University. ~100 undergraduates
- Electro-analytical Methods (Fall 2009), Helwan University. ~100 undergraduates

Guest lecturer

- Experimental Physical Chemistry, Harvard University, Spring 2025

Pedagogical Training

Bok Teaching Certificate, the Derek Bok Center for Teaching and Learning, Harvard University, 2024
An Introduction to Teaching Methods in Higher Education, Imperial College London, 2018
Understanding Yourself & Others 1: Introduction to MBTI, Imperial College London, 2018
Perfecting Presentations 4: Advanced Presentations, Imperial College London, 2018

Advising Experience

Advised 1 graduate student from MIT at Harvard CNS, Summer 2024
Advised 1 graduate student from the University of Hamburg at Harvard CNS, Summer 2023
Advised 4 graduate students at the National University of Singapore, 2019–22
Superuser of Raman Spectroscopy and Physical Vapor Deposition (PVD) at CA2DM, NUS;
responsible for providing technical training to new users, 2015–17

ADDITIONAL RESEARCH EXPERIENCE

2020-24 **Visiting Research Fellow**, Department of Chemistry, Faculty of Science, National University of Singapore, (NUS), Singapore

2015-20 **Researcher**, Berkeley Education Alliance for Research in Singapore (BEARS), The Campus for Research Excellence and Technological Enterprise (CREATE), Singapore

PROFESSIONAL SERVICE

Committee Experience

Social Committee Chair, Boston Postdoctoral Association (BPDA), 2023-present

Professional memberships

Materials Research Society, 2023; Future Insight e.V., 2023; Royal Society of Chemistry, 2021; SPIE, 2020; American Chemical Society, 2019; Optical Society of America, 2018; EuroScience, 2018