# Hussein O. Badr, PhD

Postdoctoral Scholar, Chemical Engineering Department
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**Stanford University**
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**Drexel University**

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## SUMMARY

- Over 1000 citations, h-index: 20, i10-index: 27 (Google Scholar, September 2026)
- Published 7 patent applications and over 50 peer-reviewed research articles.
- Invented *One-Dimensional Lepidocrocite Titanate, 1DLs*, the first ever reported 1D form of metal oxide nanostructures exhibiting quantum confinement as 1D material.
- First or corresponding author: Materials Today, Advanced Materials, Matter, Carbon, Chemical Engineering Journal, Langmuir, among others.
- Worked with over 60 collaborators within the US, Europe, China and worldwide.
- Participated in over 20 international conferences including MRS, ACS, MS&T, TMS, ECS, NAM, AICHE, CIMTEC and many more and built a number of collaborations.
- Mentored over 50 undergraduate and graduate students, visiting researchers, and collaborators in a holistic, encouraging, and supportive way to build up the next generation of researchers.

## EDUCATION

**Ph.D.** **Drexel University,** Philadelphia, U.S. Fall 2018 – Summer 2023
Degree in Nanostructured Materials Science and Engineering (GPA 3.97),
Thesis: Hydroxide-Derived Nanostructures: Scalable Synthesis, Characterization, Properties, and Potential Applications
Department of Materials Science and Engineering

**BSc & M.Sc.** **Cairo University,** Cairo, Egypt Fall 2011 – Summer 2018
Degree in Materials for Energy Applications,
Thesis: Polymer nanocomposites for thermoelectric applications,
Department of Metallurgical Engineering and Materials Science

## PROFESSIONAL EXPERIENCE

**➔ Stanford University, Stanford, CA, U.S.** **Spring 2024 – Present**
**- Postdoctoral Scholar, The Thomas F. Jaramillo Lab, Chemical Engineering Department**

- Developing electrocatalytic materials from metallic solid solutions & mixed-metals oxides to single atom catalysts (SACs), hexagonal boron nitride (h-BN), among others for a range of cathodic and anodic electrochemical reactions.
- Synthesis following methods including high temperature topotactic reactions, molten salt, hydrothermal treatment, co-precipitation, sol gel, physical vapor deposition (PVD), among others.
- Characterization techniques span XRD, SEM, EDS, EPMA, TEM, ICP-MS, IC, XPS, XRF, Raman, TGA, etc.
- Optimizing ink and electrode preparation toward robust operation under harsh electrochemical testing.
- Designing electrocatalytic devices and processes for electrocatalytic energy transformation.
- Synchrotron testing with operando and ex situ X-ray Absorption Spectroscopy (XAS), and X-ray Fluorescence (XRF).

### Research Projects during Postdoc in Stanford University

**Oxygen Reduction Reaction and Fuel Cells**

1. **Fuel Cell Membrane Degradation - funded by Ford Motor Co.** Employed accelerated stress testing to 50 $cm^2$ membrane electrode assemblies along with synchrotron techniques to track changes in Ce chemical state and determine (electro)chemical degradation mechanisms.

2. **Electrocatalyst-Polyelectrolyte Interfaces for Acidic ORR** - collab with Alfred Vargas. Established a mechanistic framework to engineer electrocatalyst/ionomer interfaces to modulate ORR kinetics, $O_2$ transport, and electrocatalyst electronic structure via hydrophobic additives like tetrabutylammonium ($TBA^+$) to form Nafion+$TBA^+$.

3. **Acid Stability of Cobalt Electrocatalysts for $O_2$ electrocatalysis -** collaboration with Dr. Ashton M. Aleman. Synthesis and characterization of Co bimetallic systems with Ag, Au, or Pd, which were all assessed using ICP-MS to monitor time-resolved relationships between electrocatalysis and material dissolution.

**Water Electrolysis and Wastewater Treatment**

4. **Seawater Electrolysis and Marine Carbon Removal -** funded by TotalEnergies and Stanford School of Sustainability. Design and test acid-tolerant zero-gap electrolyzer, develop dimensional stable anode materials for $Cl_2$ production, conduct technoeconomic analysis for marine carbon removal technologies, and build reactor for scale-up carbonate mineralization.

5. **Biomass-derived Catalysts for Halogenated Pollutants Degradation** - collaboration with Stanford Environmental Eng. and the Hong Kong University of Science and Technology. Engineering carbon electrodes with various oxygen functional groups (OFGs) from pyrolyzed biomass for electrochemical dehalogenation process.

6. **Wastewater Treatment and $SO_2F_2$ Fumigant Neutralization** - collaboration with Stanford Environmental Eng. and the USDA. (1) Reactor design and electrode engineering for electrochemical generation of $H_2O_2$ and OH for $SO_2F_2$ Fumigant hydrolysis. (2) Fluoride ions precipitation enhancing scrubbing solution recyclability and anode stability.

**Thermal Catalysis and $CO_2$ Hydrogenation Chemistry**

7. **$CO_2$ Activation for Low-Temperature Reverse Water-Gas Shift Reaction - funded by DOE Office of Basic sciences.** Developing alkali-promoted Cu-In catalysts enhancing RWGS activity and selectivity under T < 400 ºC and P ≈ 2-3 MPa.

**Photo-electrochemical Synthesis of Modern Fuels and Chemicals**

8. **Photoelectrochemical $H_2$ production - collaboration with U. Hawaii and funded by the US Department of Energy.** (1) Design semi-monolithic devices for PEC $H_2$ production with solar-to-hydrogen conversion efficiency > 15%.
(2) Develop transparent catalytic composite encapsulating perovskite solar cell for PEC $H_2$ and $O_2$ evolution reactions.

9. **Unassisted Solar-Driven Lithium-Mediated $N_2$ Reduction for $NH_3$ Synthesis – Collaboration with Dr. Sang-Won and Prof. Adam Nielander.** Combining theoretical modeling, illuminated *in situ* neutron reflectometry, and custom-designed triple-junction we achieved maximum $NH_3$ FE of 6.8% and 62% for unassisted and assisted systems, respectively.

**➔ Drexel University, Philadelphia, PA, U.S.** **Fall 2018 – Spring 2024**
**- PhD student/candidate, The Michel W. Barsoum Lab, Materials Science and Engineering Department.**

- Developed a novel wet chemistry protocol to prepare layered metal oxides nanostructures (various compositions, morphologies, and structures) on the kilogram scale, at near ambient conditions, and under atmospheric pressure.

- Invented the first ever reported one-dimensional (1D) form of titanium oxide nanostructure, known as "One-Dimensional Lepidocrocite Titanate, or 1DLs" which recorded bandgap of 4.1 eV.

- Investigated nanostructures performance in a variety of applications including electrocatalysis, photocatalysis, electrochemical energy storage, water treatment, dye degradation, and polymer composites.

- Entrepreneurship, Co-founded One-D-Nano startup for deployment of novel tech for electrochemical energy conversion in partnership with Drexel Office of Innovation and National Science Foundation program of commercialization (I-Corp).

- Participated in the following industrial conferences:

- ⇨ *World Hydrogen 2023 Summit in Rotterdam, The Netherlands*
- ⇨ *Hydrogen & Fuel Cells Seminar 2023 in Los Angeles, CA*
- ⇨ *Transit Agency Infrastructure Workgroup Meeting for Zero-Emission Buses*

**Research Projects during PhD in Drexel University**

**Synthetic Chemistry and Nanostructures Discovery**

**One-Dimensional Lepidocrocite Titanate (1DLs) – funded by Murata Manufacturing Co. and NSF.**
- Developed wet chemistry synthesis protocol to prepare nanostructure on the kilogram scale at near ambient conditions. -
- Invented the first ever 1D form of titanium oxide-based nanostructure, recording a bandgap of 4.1 eV.
- Investigated chemistry of self-assembly and chemical doping of 1DLs, tailoring its properties for various applications.

### MXene (Family of 2D Carbides) - Delamination Chemistry and Energy Applications

**Nucleophile Chemistry for MXene Delamination – collaboration with Dr. Varun Natu.** Investigated the delamination chemistry and surface terminations of $Ti_3C_2T_z$ MXene using nucleophile compounds and inorganic bases.

**MXene//$MnO_2$ Asymmetric Supercapacitors, AASCs - collab with Prof. Johanna Rosen at Linköping, Sweden.** Design and testing of $Mo_{1.33}CT_z$ and $TMA^+$ -$MnO_2$ cathode, reporting high voltages and high energy densities AASCs

➔ **Cairo University**, Cairo, Egypt Fall 2016 – Summer 2018
Teaching and Research Assistant, Department of Metallurgical Engineering.
➔ **American University in Cairo**, Cairo, Egypt Fall 2016 – Summer 2018
Research Assistant, Energy Materials Lab, Physics Department.
➔ **British University in Egypt**, Cairo, Egypt Fall 2016 – Summer 2018
Research Assistant, Department of Mechanical Engineering.

## AWARDS AND RECOGNITIONS

- Nominated to Research Award of Excellence, Drexel, 2023
- Featured in the Graduate College testimonial for Drexel Emerging Scholars Conference.
https://drexel.edu/graduatecollege/professional-development/emerging-graduate-scholars-conference/testimonials/
- Best Poster Award nomination in MRS Spring 2023/2023.
- Awarded the 2022-2023 Teck-Kah Lim Graduate Student Domestic Travel Subsidy Award.
- Featured in Drexel's Doctoral Newsletter in the October 2022 issue.
(https://www.linkedin.com/feed/update/urn:li:activity:6982765034011512832/)
- Featured for Matter author spotlight for the July 2022 issue.
(https://twitter.com/Matter_CP/status/1571862053760950273)
- Our article about "$TiO_2$-based one-dimensional nanofilaments" featured in the news:
Mat Today press (Bottom-up approach yields 2D nanomaterials by the kilo - ScienceDirect)
AZOnano news (https://www.azonano.com/news.aspx?newsID=38424)
- Nominated to Research Award of Excellence, Drexel, 2022
- College of Engineering Carleone Award for outstanding Research, Drexel, 2022.
- Award of Excellence in Engineering, Egyptian Engineering Association, 2019.
- Second place, Energy Competition, Egyptian Engineering Day 2016.
- Mohamed Abd Alkareem Award, College of Engineering, Cairo University, 2017.
- Award of Excellence in Engineering, Egyptian Engineering Association, 2017
- Ranked the first in 2016 class, Dept. of Metallurgical Eng., Cairo University.

# LIST OF PUBLICATIONS AND PATENTS

### ISSUED PATENTS

1) Michel W. Barsoum and **Hussein O. Badr**, "Bottom-up, scalable synthesis of oxide-based sub-nano and nanofilaments and nanofilament-based two-dimensional flakes and mesoporous powders", US Patent Application. 18/448,593

2) Michel W. Barsoum, **Hussein O. Badr** and Tarek A. ElMeligy "Nanoparticles and process of producing the same" US Patent Application No. 63/214,660.

3) Rahul N. Pai, Vibha Kalra, Michel W. Barsoum and **Hussein O. Badr**, "Onium salt derived materials as chalcogen hosts" U.S. patent application No. 63/209,318.

4) Michel W. Barsoum, **Hussein O. Badr** and Joshua Snyder "Nanomaterial-based adsorption processing and catalysis", US Patent App. 18/978,462, 2025.

5) Michel W. Barsoum and **Hussein O. Badr**, "Nanomaterial-based processing of dyes and organic compounds" US Patent Application 18/837,169, 2025.

6) Michel W Barsoum, Hussein O. Badr, Masashi Koyanagi, Akimaro Yanagimachi, "One-dimensional lepidocrocite compositions", US Patent Application US19/103,604,2026

**PENDING PATENTS**

7) Michel W. Barsoum, **Hussein O. Badr** and Kiana Montazeri "One-dimensional titanium dioxide nanostructures synthesized using alkaline solutions including sodium/potassium hydroxide at near ambient conditions" Filed in June 2022.

## PUBLICATIONS

**2026**

1) Sang-Won Lee, Myles A. Steiner, Yamile E. Cornejo-Carrillo, Mitchell Hansen, Allen Qiang, Je Min Yu, Judith Zander, Junjie Chen, Peter Benedek, Valerie Niemann, Isabela Rios Amador, Katherine Yan, **Hussein O. Badr**, Kyra M.K. Yap, Jennifer Urbine, Jeehye Kim, Wrayzene Willoughby, Ji-Wook Jang, Hanyu Wang, Michelle Young, Sarah Collins, Shaniah Greene, Matthew Young, James L. Young, Mathieu Doucet*, Todd G. Deutsch*, Thomas F. Jaramillo*, Adam C. Nielander*, "Unassisted Solar-Driven Lithium-Mediated $N_2$ Reduction for $NH_3$ Synthesis", Nat. Energy (2026). Accepted.

2) Zibo Xu, Daniel C.W. Tsang; **Hussein O. Badr**; Thomas F. Jaramillo; William A. Mitch, "Decoupling the Role of O-Containing Functional Group and Graphitic Carbon Cluster on Carbon Electrode for Electrochemical Dehalogenation Process", Environ. Sci. Technol. 60, 24472−24480 (2026). https://doi.org/10.1021/acs.est.6c05959

3) Ashton M Aleman, Colin F Crago, Alfred Vargas, Crystal H Reyes, **Hussein O. Badr**, Judith Zander, Aniket S Mule, Ryan T Hannagan, Ololade A Oriowo, B Milenia Rojas Mendoza, Michaela Burke Stevens, Thomas F. Jaramillo, "Insights into the Acid Stability of Cobalt Electrocatalysts via Time-Resolved Activity-Durability Relationships for Tailored Bimetallic Thin Films" Adv Energy Mater (2026). https://doi.org/10.1002/aenm.202504936

4) **Hussein O. Badr**, Alfred Vargas, Ashton Aleman, Ryan Hannagan, Hector Richard, Dong Un Lee, Mike Boyd, Dolan Rachael, Thomas Jaramillo, "Advanced Methods to Understand Membrane Degradation in Fuel Cell Membrane Electrode Assemblies, MEAs", In preparation.

5) Cade Napier, **Hussein O. Badr**, Thomas F. Jaramillo, William Mitch, "On-Site Electrochemical Oxygen Reduction to Hydroxide and Hydrogen Peroxide for Sulfuryl Fluoride Solution Hydrolysis", In Preparation.

6) Isabela Rios Amador, Hector Richard, Ryan Hannagan, **Hussein O. Badr**, Samantha Reising, Valeria Cartagena, Jesse Matthews, Sang-Won Lee, Daniel B. Whitt, Jonathan Raisin, Daniel Lee, Adam C. Nielander, Thomas F. Jaramillo, "Catalyst Design, Device Fabrication, and Deployment Analysis of a Seawater Electrolyzer for Marine Carbon Dioxide Removal", Submitted.

7) Ezgi Erdem, Junjie Chen, Dong Un Lee, Rachel Spurlock, Sang-Won Lee, **Hussein O. Badr**, Andrzej T. Rogala, Thomas F. Jaramillo, "Enhancing the Low Temperature Reverse Water-Gas Shift Activity of Cu-In Catalyst with Potassium", In Preparation.

8) Nicholas Carpentieri, **Hussein O. Badr**, Kiana Montazeri, Mary Qin Hassig, Gregory Schwenk, Ramchandra Gawas, Michel Barsoum, Joshua Snyder, "Ni/Fe Doped One Dimensional Lepidocrocite Titania and Oxygen Evolution Reaction", In Preparation.

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**2025**

9) Mohamed A Ibrahim, Adam D Walter, **Hussein O Badr**, Gregory R Schwenk, Ahmed MH Ibrahim, Vanessa R Morris, Sébastien Boukhris, Mihaela Florea, Doru Constantin, Michel W Barsoum, "Expanding the processing space of quantum confined, one-dimensional titania-based lepidocrocite nanofilaments", Matter (2025), 8, 102260. https://doi.org/10.1016/j.matt.2025.102260

10) Sukanya Maity, Mohamed Ibrahim, Hussein Badr, Treesa Reji, Mary Q Hassig, Tongjie Zhang, Christopher Li, Johanna Rosén, Michel W Barsoum, "Titanium Oxysulfate-Derived 1D Lepidocrocite Titanate Nanostructures", Adv. Mater. Interfaces (2025), 12, 2400866. https://doi.org/10.1002/admi.202400866

11) Irem Algan Simsek, **Hussein O Badr**, Neal A Cardoza, Erika Colin-Ulloa, Gregory Schwenk, Kaustubh Sudhakar, Ulf Wiedwald, Michael Farle, Vibha Kalra, Mohamed Ahmed Ibrahim Ibrahim, Lyubov Titova, Michel W Barsoum, "Spinel-Structured High Entropy Oxides: Low Temperature Synthesis, Characterization, and Potential Applications" ACS Omega (2025). https://doi.org/10.1021/acsomega.5c00902

12) Sébastien Boukhris, Alexandra C Iacoban, Mohamed Ibrahim, **Hussein Badr**, Andrei C Kuncser, Stefan Neatu, Florentina Neatu, Michel W Barsoum, Mihaela Florea, Doru Constantin, "Structural Analysis of Colloidal Titania-Based Ribbons and Their Self-Assembly upon Drying", Small Struct. (2025). https://doi.org/10.1002/sstr.202500017

13) Mary Qin Hassig, Adam D Walter, Vanessa R Morris, Yucheng Zhu, Ahmed MH Ibrahim, Abijah Gordon, Mohamed A Ibrahim, Hao Cheng, **Hussein O. Badr**, Michel W Barsoum, "Colloidal Stability, Sedimentation, and Aggregation of Crystalline Two-Dimensional Crumpled Birnessite Flakes, Their Dye Adsorption and Immune Cell Response" Langmuir (2025). https://doi.org/10.1021/acs.langmuir.4c03802

14) Jiafeng Ouyang, **Hussein O. Badr**, Junlong Xiebin, Yang Yang, Lin Wang, Yang Liu, Haowei Tu, Dadong Shao, Zijie Li, Liyong Yuan, Michel W Barsoum, Weiqun Shi. "Selective Th (IV) separation and immobilization by one-dimensional lepidocrocite titanate", Chem. Eng. J. (2025), 505. https://doi.org/10.1016/j.cej.2025.159619

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**2024**

15) Shrabani Panigrahi, **Hussein O. Badr**, Jonas Deuermeier, Santanu Jana, Elvira Fortunato, Rodrigo Martins, Michel W Barsoum, "Interfacial Engineering with One-Dimensional Lepidocrocite TiO2-Based Nanofilaments for High-Performance Perovskite Solar Cells", ACS Omega (2024), 9, 50820−50829. https://doi.org/10.1021/acsomega.4c09516

16) Treesa Reji, Adam D Walter, Yasunori Hioki, Tracey Curran, Mary Qin Hassig, **Hussein O. Badr**, Gregory R Schwenk, Takeshi Torita, Megan A Creighton, Michel W Barsoum, "Hierarchically Porous Anatase Nanoparticles Derived from One-Dimensional Lepidocrocite Titanate for Bisphenol-A Photodegradation", ACS Omega (2024). https://doi.org/10.1021/acsomega.4c07224

17) Akimaro Yanagimachi, Takayuki Kono, Kota Ota, Takeshi Torita, Daja R Bonilla, Daniel E Autrey, **Hussein O. Badr**, Michel W Barsoum, "Investigation of Ultramicroporous Structure of One-Dimensional Lepidocrocite Titanates Using Carbon Dioxide and Nitrogen Gases" Langmuir (2024), 40, 32, 16929-16935. https://doi.org/10.1021/acs.langmuir.4c01689

18) **Hussein O. Badr** and Michel W. Barsoum, "Hydroxide-derived Nanostructures: Scalable Synthesis, Characterization, Properties and Potential Applications" Adv. Mater. (2024), 36, 28, 2402012. https://doi.org/10.1002/adma.202402012

19) Francisco Lagunas, David Bugallo, Fatemeh Karimi, Yingjie Yang, **Hussein O. Badr**, Jacob H Cope, Emilio Ferral, Michel W Barsoum, Yong-Jie Hu, Robert F Klie, "Ion-Exchange Effects in One-Dimensional Lepidocrocite $TiO_2$: A Cryogenic Scanning Transmission Electron Microscopy and Density Functional Theory Study" (2024) Chem Matter, 36, 2743-2755. https://doi.org/10.1021/acs.chemmater.3c02773

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**2023**

20) **Hussein O. Badr**, Jacob Cope, Takayuki Kono, Takeshi Torito, Francisco Lagunas, Emmanuel Castiel, Robert F. Klie, and Michel W. Barsoum, Titanium Oxide-based 1D Nanofilaments, 2D Sheets, and Mesoporous Particles - Synthesis, Characterization and Ion Intercalation (2023) Matter 6, 3538-3554. https://doi.org/10.1016/j.matt.2023.07.022

21) **Hussein O. Badr**,^ Francisco Lagunas,^ Daniel E. Autrey, Jacob Cope, Takayuki Kono, Takeshi Torita, Robert F. Klie, Yong-Jie Hu, and Michel W. Barsoum, "On the Structure of One-Dimensional $TiO_2$ Lepidocrocite" (2023) Matter 6, 128-141. https://doi.org/10.1016/j.matt.2022.10.015

22) Olivia Wilson, Michael Carey, Jacob Cope, **Hussein O. Badr**, Jacob Nantz, Tarek Elmelegy, Michel Barsoum, Andrew Magenau, Repairable and Reinforced Composites of One-Dimensional Titania Lepidocrocite Mesoparticles with Thiol-Yne Networks via Alkylborane-Initiated, In Situ, "Click" Polymerization, (2023) Chem. Mater. https://doi.org/10.1016/j.xcrp.2023.101434

23) Erika Colin-Ulloa, Julia L. Martin, Ryan J. Hanna, Michelle H. Frasch, Rebecca R. Ramthun, **Hussein O. Badr**, Michel W. Barsoum, Ronald L. Grimm, and Lyubov V. Titova, "Electronic Structure of 1D Sub-nanometer Lepidocrocite-Like Structures as Revealed by Transient and Steady-State Optical Absorption and Photoelectron Spectroscopy", (2023) J. Phys. Chem. C., 127, 15, 7275-7283. https://doi.org/10.1021/acs.jpcc.2c06719

24) Gregory R. Schwenk, **Hussein O. Badr**, Adam D. Walters, Takayuki Kono, Mary Qin Hassig, Kiana Montazeri, M. W. Barsoum, "Hydroxide-Derived Mild Synthesis of Titania: 1D Lepidocrocite Nanotubes and Nanowires" (2023) Ceramics Int. 49, 24, 40001-40010. https://doi.org/10.1016/j.ceramint.2023.09.328

25) Lin Wang[#], **Hussein O. Badr**[#], Yang Yang[#], Jacob Cope, Enzhao Ma, Jiafeng Ouyang, Liyong Yuan, Zijie Li, Zhirong Liu, Michel W. Barsoum, Weiqun Shi, "Unique Hierarchical Structures of One Dimensional Lepidocrocite Titanate with Cation-Exchangeable Sites for Extraordinary Selective Actinide Capture for Water Purification", (2023) J. Chem. Eng. 474, 145635. https://doi.org/10.1016/j.cej.2023.145635

26) Kaustubh Sudhakar, Takayuki Kono, Tarek El-Melegy, **Hussein O. Badr**, Prajwal L. Mulukatte, Kiana Montazeri, Steven May, and Michel W. Barsoum, "One pot, scalable synthesis of hydroxide derived ferrite magnetic nanoparticles" (2023) J. Magn. Magn. Mater. 582, 170986. https://doi.org/10.1016/j.jmmm.2023.170986

27) Neal Cardoza; **Hussein O. Badr**; Rhyz Pereira; Michel Barsoum; Vibha Kalra, "One-Dimensional, Titania Lepidocrocite-based, Nanofilaments and Their Polysulfide Anchoring Capabilities in Lithium Sulfur Batteries" (2023) ACS Appl. Mater. Interfaces 15, 44, 50973. https://doi.org/10.1021/acsami.3c03743

28) Mary Qin Hassig, Takayuki Kono, Michael Carey, Kaustubh Sudhakar, Gregory R. Schwenk, **Hussein O. Badr**, Michel W. Barsoum, "Reacting $Mn_3O_4$ powders with quaternary ammonium hydroxides to form two-dimensional birnessite flakes" Ceram. Int. 49, 21, 33537-33545. https://doi.org/10.1016/j.ceramint.2023.07.256

29) **Hussein O. Badr** and Michel W. Barsoum, On Ripplocations and the Deformation of Graphite, **Carbon** 201, (2023) 599-615. https://doi.org/10.1016/j.carbon.2022.09.042

30) Kaustubh Sudhakar, Avishek Karmakar, **Hussein O. Badr**, Kiana Montazeri, Craig Johnson, Mary Q. Hassig, Michael Carey, Tarek El-Melegy, Stefan Masiuk, Qian Qian, C. Li and Michel W. Barsoum‡*, "One-dimensional, titania-based lepidocrocite nanofilaments and their self-assembly", (2023) Matter 6, 9, 2834-2852. https://doi.org/10.1016/j.matt.2023.06.006

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**2022**

31) **Hussein O. Badr**, Tarek El-Melegy, Michael Carey, Varun Natu, Mary Q. Hassig, Craig Johnson, Qian Qian, Christopher Y. Li, Kateryna Kushnir, Erika Colin-Ulloa, Lyubov V. Titova, Julia L. Martin, Ronald L L. Grimm, Rahul Pai, Vibha Kalra, Avishek Karmakar, Anthony Ruffino, Stefan Masiuk, Kun Liang, Michael Naguib, Olivia Wilson, Andrew Magenau, Kiana Montazeri, Yucheng Zhu, Hao Cheng, Takeshi Torita, Masashi Koyanagi, Akimaro Yanagimachi, Thierry Ouisse, Maxime Barbier, Fabrice Wilhelm, Andrei Rogalev, Jonas Björk, Per O.Å. Persson, Johanna Rosen, Yong-Jie Hu, Michel W. Barsoum "Bottom-up, scalable synthesis of two-dimensional titanium carbo-oxide-based conductive flakes", (2022) **Mat. Today** 54, 8-17. https://doi.org/10.1016/j.mattod.2021.10.033

32) **Hussein O. Badr**, Kiana Montazeri, Tarek El-Melegy, Varun Natu, Michael Carey, Ramchandra Gawas, Phu Phan, Qian Qian, Christopher Y Li, Ulf Wiedwald, Michael Farle, Erika Colin-Ulloa, Lyubov V Titova, Marc Currie, Thierry Ouisse, Maxime Barbier, Andrei Rogalev, Fabrice Wilhelm, Marcus Hans, Jochen M Schneider, Christopher Tandoc, Young-Jie Hu, Joshua Snyder, Michel W Barsoum, "Scalable, Inexpensive, Facile Synthesis of Two-dimensional Manganese Oxide Birnessite", **Matter** 5, 7, (2022) 2365-2381. https://doi.org/10.1016/j.matt.2022.05.038

33) **Hussein O. Badr**, Varun Natu, Ștefan Neațu, Florentina Neațu, Andrei Kuncser, Arpad M. Rostas, Matthew Racey, Michel W. Barsoum, and Mihaela Florea, "Ultra-stable, 1D $TiO_2$ Lepidocrocite for Photocatalytic Hydrogen Production in Water-Methanol Mixture", (2022) Matter. https://doi.org/10.1016/j.matt.2023.05.026

34) Kiana Montazeri; **Hussein O. Badr**; Ken Ngo; Kaustubh Sudhakar; Tarek Elmelegy; Joshua Uzarski; Varun Natu; Michel Barsoum, "Delamination of MXene Flakes Using Simple Inorganic Bases" (2022), J. Phys. Chem. C., 127, 10391-10397. https://doi.org/10.1021/acs.jpcc.3c02318

35) Wei Zheng, Joseph Halim, Li Yang, **Hussein O. Badr**, Zheng Ming Sun, Per O.Å. Persson, Johanna Rosen, Michel W. Barsoum, "MXene//$MnO_2$ asymmetric supercapacitors with high voltages and high energy densities", (2022) **Batter. Supercaps,** 5, e20220015. https://doi.org/10.1002/batt.202200151

36) Ayat Ellamey, **Hussein Badr**, and Iman El-Mahallawi, "Structure and Thermoelectric Behavior of Polyaniline-based/ CNT-composite", **Curr. Appl. Phys**, 2022. https://doi.org/10.1016/j.cap.2021.11.012

37) Varun Natu, Rahul Pai, Olivia Wilson, Edward Gadasu, **Hussein Badr**, Avishek Karmakar, Andrew J. D. Magenau, Vibha Kalra, and Michel W. Barsoum, "Effect of Base/Nucleophile Treatment on Interlayer Ion Intercalation, Surface Terminations, and Osmotic Swelling of $Ti_3C_2Tz$ MXene Multilayers Chem. Mater. 2022, 34, 2, 678–693 https://doi.org/10.1021/acs.chemmater.1c03390

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**2017-2021**

38) **Hussein O. Badr**, X. Zhao, S. Koumlis, G. J. Tucker, L. Lamberson and M. W. Barsoum, Confined buckling in thin sheets and its correlation to ripplocations; a deformation mechanism in layered solids, (2021) **Phys. Rev. Mater.** 5, 093603. https://doi.org/10.1103/PhysRevMaterials.5.093603

39) Luke A Hanner, **Hussein O. Badr**, Martin Dahlqvist, Sankalp Kota, David Raczkowski, Johanna Rosen, Michel W Barsoum, "Synthesis, characterization and first principle modelling of the MAB phase solid solutions: $(Mn_{1-x}Cr_x)_2AlB_2$ and $(Mn_{1-x}Cr_x)_3AlB_4$", (2021) **Mater. Res. Lett.**, 9. https://doi.org/10.1080/21663831.2020.1845834

40) **Hussein O. Badr**, Aurélie Champagne, Thierry Ouisse, Jean-Christophe Charlier, Michel W Barsoum, "Elastic properties and hardness values of $V_2AlC$ and $Cr_2AlC$ single crystals" (2020) **Phys. Rev. Mater.** 4, 083605. https://doi.org/10.1103/PhysRevMaterials.4.083605

41) Ayat Ellamey, Ahmed Sedki, Amr Hasanin, **Hussein Badr**, Iman El-Mahallawi, "Design and Manufacturing of Polyaniline-based Thermoelectric Generators", IEEE, 214-216, 2019. https://doi.org/10.1109/ACCS-PEIT48329.2019.9062855

42) **Hussein Badr**, Iman S El-Mahallawi, Fawzi A Elrefaie, Nageh K Allam, "Low-temperature thermoelectric performance of novel polyaniline/iron oxide composites with superior Seebeck coefficient", (2019) Appl. A, 125. https://doi.org/10.1007/s00339-019-2822-3

43) **H. O. Badr**, M Sorour, SF Saber, IS El-Mahallawi, FA Elrefaie "DOC-Stabilized PVAc/MWCNTs Composites for Higher Thermoelectric Performance", Energy Technology, 283-291, TMS, 2019. https://doi.org/10.1007/978-3-030-06209-5_29

44) Iman El-Mahallawi, **Hussein Badr**, Remon Ashraf and Saeed S.I.AlMishal, "Sustainable Materials for Energy Conversion" Reference Module in Materials Science and Materials Engineering, 2018.

45) IS El-Mahallawi, AA Abdel-Rehim, N Khattab, NH Rafat, **H. O. Badr** "Effect of Nano-graphite Dispersion on the Thermal Solar Selective Absorbance of Polymeric-based Coating Material", Advanced Materials for Energy Conversion and Storage, TMS, 2017. https://doi.org/10.1007/978-3-319-72362-4_49

46) **Hussein Badr**, Mostafa Amr Youssef, Hebatullah Sayed Abd Elsalam, Mirna Abd Elrahman Mohamed, Mohamed Gamal El-kholy, Iman S. El-Mahallawi, Ahmed A Abdel-Rehim "Thermoelectric behavior of polyvinyl acetate / CNT composites", Alloys and Compounds for Thermoelectric and Solar Cell Applications V symposium, TMS, 2016. https://doi.org/10.1007/978-3-319-51493-2_27