AHMAD MAJED, Ph.D
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EDUCATION

Tulane University, New Orleans, LA, USA
Doctor of Philosophy, Materials Physics and Engineering, 2019 – May 2024 (3.8/4)
Dissertation: "Synthesis of 2D transition metal carbo-chalcogenides and their application as electrode materials for electrochemical energy storage"
Advisor: Prof. Michael Naguib

Ain Shams University, Cairo, Egypt
Master of Science, Materials Engineering, Metallurgy, 2016 – 2019 (3.9/4)
Thesis: "Effect of friction stir processing on microstructure and hardness of NiAl bronze alloy"
Advisors: Profs. Nahed El-Mahallawy and Moustafa Gouda

Bachelor of Science, Major in Mechanical Engineering, Minor in Manufacturing, 2009 – 2014 (3.5/4)

TEACHING AND MENTORING EXPERIENCE

Professor of Practice, Tulane University, New Orleans, LA, USA Fall 2024 – Present
- Mechanics of Materials
- Thermodynamics of Materials

Invited Lecturer, Tulane University, New Orleans, LA, USA
- Materials science and Engineering: *Mechanical properties of materials* Spring 2024
- Materials science and Engineering: *Imperfections in solids* Spring 2024
- Mechanical Behavior of Materials: *Welding inspection using non-destructive testing*. Fall 2023
- Synthesis of Nanomaterials: *Characterization of nanomaterials: Crystal structure*. Fall 2023
- Synthesis of Nanomaterials: *Characterization of nanomaterials: Chemistry*. Fall 2023
- Professional Development for Engineers: *Communicating science with entertainment.* Spring 2023
- Thermodynamics of Materials: *Performing thermodynamic calculations using FactSage.* Spring 2023

Teaching assistant, Physics Department, Tulane University, New Orleans, LA, USA Fall 2019 - May 2024
- Assist lecturer in delivering engineering courses, delivered +150 office hours, corrected +100 homework assignments and exams, built interactive homework assignments to assess students and enhance their critical thinking skills.
- ***Courses:*** Materials science and engineering, physics lab, thermodynamics of materials, mechanical behavior of materials, synthesis of nanomaterials

Lab senior, Naguib Lab for Novel Energy Materials, Tulane University Fall 2019 - Now
- Taught 10 PhD students and 1 post doctorate XPS data analysis.
- Mentored 10 undergraduate researchers.
- Superuser of gloveboxes and x-ray diffraction machine, taught all users how to use them, performed constant preventive and reactive maintenance as needed.

Teaching Assistant, Eng. Design & Production Department, German University in Cairo, Egypt 2015-19
- Assist lecturer in delivering engineering courses, delivered 2,300 teaching hours of tutoring to +500 students in 7 courses. Proctored +2,000 students during quizzes and exams.
- Mentored 5 undergraduate graduation projects.
- ***Courses:*** Engineering design, engineering drawing, production engineering, materials processing and characterization, computer aided design (CAD)

Aikido Instructor, Bakkar Dojo, Cairo, Egypt 2016-19
- Taught self-defense techniques to +100 participants with age varying from 4-70 years. Examined +200 participants for upgrade exams and tournaments.

Science Communicator, Nutty Scientists, Cairo, Egypt May – Jun 2015
- Delivering science concepts to kids.

PROFESSIONAL EXPERIENCE

Mechanical Design Engineer, Shalakany Factory for Convection Ovens, Cairo, Egypt 2016-17

- Led a team of three technicians to reverse engineer convection ovens with budget $5k – $10k. Built full CAD model of convection ovens using Autodesk Inventor and submitted engineering drawing files for laser cutting, sheet bending, and assembly.

Mechanical Design Engineer, Kandeel Glass, Cairo, Egypt Jun – Sep 2015

- Reverse engineered conveyor belts and mechanical tables handling glass products and dies. Built full CAD models of mechanical tables using Inventor.

Maintenance Engineer, EgySwiss, Cairo, Egypt Nov 2014 – Mar 2015

- Led a team of three technicians aiming to maintain one of three major industrial sections in the company. Performed reactive and preventive maintenance to multiple instruments in storing, heating, and packing FMCGs. Checking oil quality, bearing & shaft life, inspection for cracks or unusual noise.

FELLOWSHIPS, HONORS, AND AWARDS

William and Catherine Spaar memorial scholarship, Tulane University	2023
Best presentation award, Physics and Engineering Physics colloquium, Tulane University	2023
Best poster award, American Chemical Society, Drexel University	2022
Best presentation award, Physics and Engineering Physics colloquium, Tulane University	2021
Graduate student excellence scholarship, Ain Shams University	2017
Undergraduate honors scholarship, Ain Shams University	2009-14

RESEARCH EXPERIENCE

Research assistant, Prof. Michael Naguib, Tulane University Aug 2019 – May 2024

Naguib Lab for Novel Energy Materials

- Conduct research on novel nanolayers and their electrochemical applications. Connect with 15 researchers from all around the world aiming to push forward the boundaries of knowledge.
- Co-founded TMCCs, a new family of nanolayers. Synthesized wide range of inorganic layered ceramics using solid-state synthesis; MAX, MAB, TMDCs, and TMCCs. Chemically etched layered ceramics using acidic and basic solutions to produce exfoliable structures such as MXene and vdW–TMCC.
- Not only exfoliated nanolayers using chemical, mechanical, and electrochemical methods, but also enhanced production rate, scalability, quality, and cost efficiency.
- Tested electrochemical performance using Li-ion and Na-ion batteries with cyclic voltammetry, PEIS, and galvanostatic charge and discharge. Assembled coin cells using drop casting or doctor blade.
- Supervision of lab safety; ensure all hazardous chemicals, treatments, actions are well addressed with their standard operating procedures (SOPs).
- Installation and maintenance of wide range of instruments, made decisions saved **+$200k**.

This work resulted in 7 publications in Advanced Materials, Small Methods, and InfoMat and was funded partially by NASA, and NSF. I was awarded the SPAAR fellowship for distinguished graduate students in Engineering.

Graduate Researcher, Profs. Nahed El-Mahallawy, Moustafa Gouda 2016-19

- Study the effect of friction stir processing on the microstructure and hardness of nickel aluminum copper-based alloys.
- Designed, selected material, and synthesized friction stir processing tool; tough body made of H13 steel, and a hard tip made of tungsten carbide.
- Constructed an Arduino circuit incorporated with a thermocouple to measure and record the variation in temperature during treatment.

Manufacturer, Profs. Mohamed AbdelAziz & Adel El-Sabbagh, Ain Shams University 2013-14

ASU racing team

- Designed, synthesized, and tested an impact attenuator, to be fixed into a *Formula1* racing car. Worked with a team of 35 undergraduate students from different departments to turn the design of a racing car into reality.
- Revised and implemented all drawings from other teams. Coordinated different synthesis techniques such as 3D laser cutting of steel tubes, welding, making the monocoque, car assembly, and shipping.
- Handled over my experience to the team for the following years, making ASU racing team 6th Efficient car overall out of +100 teams in 2019.

SKILLS

- **Experimental Techniques:** Optical microscope (OM), scanning electron microscope (SEM), Transmission electron microscopes (TEM), energy dispersive x-ray spectroscopy (EDS), selected area electron diffraction (SAED), Vickers hardness test, tensile test, x-ray diffraction (XRD), linear four probe electrical conductivity, UV-vis-IR spectrometry, thermogravimetric analysis (TGA), solid state synthesis, induction furnace, chemical treatments, etching, intercalation, sedimentation, annealing, liquid exfoliation, glovebox, electrochemical slurry, drop casting, doctor blade, coin cell assembly, electrochemical testing and analysis.
- **Computational Skills:** CasaXPS, Topaz, PDFgui, Biologic, LANDH, Blender, ImageJ, VESTA, Mendeley, Endnote, Inventor, SolidWorks, AutoCAD, Microsoft Office (Word, Excel, PowerPoint).
- **Data analysis:** XRD Rietveld refinement, N-PDF refinement, XPS deconvolution, capacitance contribution calculations.

PUBLICATIONS

Google Scholar

1. **Majed, A.**, Torkamanzadeh, M., Nwaokorie, C.F., Eisawi, K., Dun, C., Buck, A., Urban, J.J., Montemore, M.M., Presser, V. and Naguib, M., 2023. Toward MBenes Battery Electrode Materials: Layered Molybdenum Borides for Li-Ion Batteries. *Small Methods*, p.2300193.
2. **Majed, A.**, Kothakonda, M., Wang, F., Tseng, E.N., Prenger, K., Zhang, X., Persson, P.O., Wei, J., Sun, J. and Naguib, M., 2022. Transition Metal Carbo-Chalcogenide "TMCC:" A New Family of 2D Materials. Advanced Materials, 34(26), p.2200574.
3. Husmann, S., Torkamanzadeh, M., Liang, K., **Majed, A.**, Dun, C., Urban, J.J., Naguib, M. and Presser, V., 2022. Layered Nano-Mosaic of Niobium Disulfide Heterostructures by Direct Sulfidation of Niobium Carbide MXenes for Hydrogen Evolution. *Advanced materials interfaces*, *9*(14), p.2102185.
4. Wang, L., Torkamanzadeh, M., **Majed, A.**, Zhang, Y., Wang, Q., Breitung, B., Feng, G., Naguib, M. and Presser, V., 2022. Time-Dependent Cation Selectivity of Titanium Carbide MXene in Aqueous Solution. *Advanced Sustainable Systems*, *6*(3), p.2100383.
5. Liang, K., Tabassum, A., **Majed, A.**, Dun, C., Yang, F., Guo, J., Prenger, K., Urban, J.J. and Naguib, M., 2021. Synthesis of new two-dimensional titanium carbonitride $Ti_2C_{0.5}N_{0.5}T_x$ MXene and its performance as an electrode material for sodium-ion battery. *InfoMat*, 3(12), pp.1422-1430.
6. Kumar, V., Yeole, P., **Majed, A.**, Park, C., Li, K., Naguib, M., Ravindranath, P.K., Jafta, C., Spencer, R., Compton, B. and Vaidya, U., 2021. MXene reinforced thermosetting composite for lightning strike protection of carbon fiber reinforced polymer. Advanced Materials Interfaces, 8(17), p.2100803.
7. El-Mahallawy, N., **Majed, A.** and Maboud, A.A.G.A., 2020. Effect of FSP process parameters with air blowing on microstructure and hardness of NiAl Bronze alloy. *Materials Research Express*, 7(1), p.016590.
8. Subedi, B., Khatoon, N., Gaire, M., **Majed, A.**, He, J., Zhang, X., & Chrisey, D. B. Rapid Fabrication of Binder Free Nickel Cobalt Oxide Electrodes with Forest-Like Architecture for Electrochemical Energy Storage Applications. *Available at SSRN 4737632*.

UNDER SUBMISSION

1. **Majed, A.**, Naguib, M., Rapid and Scalable Synthesis and Structure of Solid-Solution Layered Titanium Niobium Carbosulfide "$Ti_xNb_{2-x}SC$".
2. **Majed, A.**, Naguib, M., Scalable Synthesis and Electrochemical Performance of Ta-Nb Solid Solutions in Transition Metal Carbo-Chalcogenides (TMCCs).
3. **Majed, A.**, Birkner, N., Wang, H.W., Halim, J., Rosén, J., Brinkman, K., Naguib, M., Resolving layer structure, interlayer stacking interactions, surface chemistry, and calorimetry studies of Nb_2S_2C.
4. Grützmacher, P., **Majed, A.**, Gachot, C., Naguib, M., Tribological behavior of Nb_2S_2C and Ta_2S_2C.

WORKSHOPS AND INTERNATIONAL CONFERENCES

PARTICIPANT *Teaching Professor Conference, New Orleans, USA* 2024
PRESENTATION "New developments in two-dimensional transition metal carbo-chalcogenides (TMCCs)." *ACS Spring Conference, New Orleans, USA* 2024
PITCH "Improving energy efficiency using thin sheets" *3-Minute Thesis, Tulane University, USA* 2023
POSTER "TMCCs: A New 2D Family of Transition Metal Carbo-Chalcogenides." *5th US School on Total Scattering Analysis.", Oak Ridge National Lab, Knoxville, TN, USA* 2023
PRESENTATION "Synthesis, structure, and properties of new solid solution 2D transition metal carbo-chalcogenides." *50th MRS Spring Conference, San Francisco, USA* 2023
PRESENTATION "Transition Metal Carbo-Chalcogenide "TMCC" a New Family of Two-dimensional Materials." *MS&T22 Conference, Materials Science & Technology, Pittsburgh, USA* 2022
POSTER "TMCC: A New 2D Family of Transition Metal Carbo-Chalcogenide." *2nd MXene Addressing Global Challenges with Innovation Conference, Drexel University, Philadelphia, USA* 2022
PRESENTATION "Synthesis & Electrochemical Performance of Mo_2AlB_2 as Electrode Material for Li-ion Battery." *48th MRS Spring Conference, Honolulu, Hawai'i, USA* 2022
PRESENTATION "Effect of friction stir processing on the structure and properties of NiAl bronze alloy." *4th Welding and Failure Analysis of Engineering Materials, Aswan, Egypt* 2018

LANGUAGES

Arabic (Native), English (Fluent), Spanish (Beginner), French (Beginner).

VOLUNTEERING AND OUTREACH

Innovation Judge, First Lego League FLL, New Orleans, USA 2024
- Receive presentations from 10 teams with an average of 8 students each.
- Assess presentation performance from the perspective of innovation.

Instructor, Tulane University, New Orleans, USA 2021-24
- Delivering science concepts to +50 kids in BATS "Boys at Tulane School" and GiST "Girls in Science at Tulane" and 5 teachers.

Representative, Graduate Studies Student Association, Tulane University, New Orleans, USA 2021-22
- Represent physics department, attended monthly meetings, discussed student related issues, and voted on decisions. Briefed and delivered updates to graduate students.

Coach, Ihyaa academy, Egypt 2013-17
- Led 10 coaches develop program on multiple intelligence theory for 8-10 years old kids.

Representative, Student Union, Ain Shams University, Egypt 2011-13
- Facilitated +10 student activities perform events on-campus. Led 10 student union members. Developed bylaws to protect and guide relationships between students, clubs, and University.

Volunteer, Annual Conference for Engineering Students, ACES 2009-12
- Recruit, train, and lead 9 moderators out of +30 applicants to lead 3 workshops, implemented a development plan. Worked in a team of 3 moderators to recruit, train, and moderate 25 students out of

+200 applicants for a workshop about problem solving, to present reasonable analysis to everyday problems. Designed an elevator pitch of 12 workshops and presented it to +300 students.

REFERENCES AVAILABLE UPON REQUEST