



Soon-to-be graduate with a Ph.D. in Chemical and Biological Engineering. A motivated, innovative, problem-solving research professional with several years of experience in characterization of materials such as semiconductor heterostructures and photovoltaic absorbers. Highly skilled in electrical, optical, and morphological characterization techniques. Goal-oriented, self-started, team player, and able to adapt quickly. Looking forward to applying my experience in a corporate environment.

## Areas of Expertise

- Photovoltaic materials characterization (ex: CdTe, CIGS, Perovskite, Si, CZTS,  $\text{Cu}_3\text{AsS}_4$ )
- Thin film fabrication
- Heterostructures (semiconductor/semiconductor, metal/semiconductor, metal/metal alloy)
- Characterization and synthesis of nanostructured materials
- Ultrafast time-resolved characterization of materials  
[ex: Time resolve photoluminescence, Time resolved absorption/reflection spectroscopy (UV-Vis-IR-THz)]
- UV-Vis absorption
- Static photoluminescence
- SEM
- FTIR
- Research & Development
- Team collaboration
- Mentorship
- Engineering Software Skills:  
COMSOL, SCAPS, wxAMPS, OriginPro, Microsoft office, Programming (MATLAB, Python, C++, C, Fortran) and Numerical analysis

## Experience

**Research Assistant**, Drexel University (Fall 2016-Current)

**Philadelphia, PA**

- **Solar cell device characterization**

In-operando measurement and analysis of solar cell devices to understand how experimental results depend on selected aspects of composition, defects, and materials' property in thin-film solar cells. (ex: CdTe, CIGS)

**Key Accomplishments:**

- Developed simulation models employing MATLAB scripts and PV simulators such as COMSOL semiconductor module, SCAPS, and wxAMPS to extract photophysical parameters under operational conditions.
- Built capabilities for time resolved terahertz spectroscopy (TRTS) to probe carrier lifetimes up to 10 ns for good quality PV materials. The conventional TRTS was limited up to 1.4 ns.
- Developed metrology platform that can be employed to evaluate a wide range of thin film PV devices based on experimental and simulation results to expedite improvements in device efficiency.

- **Ultrafast measurements and characterization of nanostructured materials**

Ultrafast time resolved spectroscopy measurement of wide range of nanostructured materials and PV absorbers to gain better understanding of the evolution photoexcited electrons and holes. This advanced knowledge of electronic processes can translate into improved photophysical systems performance.

**Key Accomplishments:**

- Developed mathematical models using MATLAB to distinguish and quantify the electronic processes in functionalized CdSe/CdS quantum dots. This model can be employed to study photophysical processes for any other nanostructured systems as well.
- Developed numerical approaches to simulate time resolve photoluminescence and time resolved terahertz data sets simultaneously to extract rate limiting recombination processes in photovoltaic absorbers.

- **Nanocrystal synthesis and thin film fabrication**

Experienced in nanocrystal synthesis and optical and electrical characterization of colloids and thin films.

**Key Accomplishment:**

- Deposited thin film PV absorbers through low-voltage, and scalable electrophoretic deposition of colloidal nanocrystals (ex: CZTS, CuSbS<sub>2</sub>)
- Investigated photoexcited carrier dynamics in thin film absorbers with ultrafast time resolved techniques and extracted recombination rate limiting processes.

**Teaching Assistant**, Drexel University

**Philadelphia, PA**

Thermodynamics 2 (CHE 330), Computation Methods (CHE 220), Process Systems Analysis and Control, Solar Cell

## Education

**Ph. D. in Chemical Engineering**, Philadelphia, PA

Drexel University, GPA: 3.91/4.0

Sep. 2016 – Jun. 2021

**B. S. in Chemical Engineering**, Tehran, Iran

Amirkabir University of Technology (Tehran Polytechnic)

2010 – 2015

**Certificates:** Machine Learning, Coursera Online, By Andrew NG Professor of Stanford University (Sep. 2018)

## Honors and Awards

**Koerner Family Fellowship**, Drexel University, April 2019

- Awarded to one student within each engineering discipline, intended to recognize and support the research activities pursued by outstanding Ph.D. students in Drexel's College of Engineering

## Publications

- **Taheri, M.M.**; Elbert, K.C.; Yang, S; Diroll, B.T.; Park, J.; Murray, C.B.; Baxter, J.B. Distinguishing electron and hole dynamics in functionalized CdSe/CdS core/shell quantum dots using complementary ultrafast spectroscopies and kinetic modeling. 2020, Submitted.
- Willis, D. E.; **Taheri, M. M.**; Kizilkaya, O.; Leite, T. R.; Zhang, L.; Ofoegbuna, T.; Ding, K.; Dorman, J. A.; Baxter, J. B.; McPeak, K. M. Critical Coupling of Visible Light Extends Hot-Electron Lifetimes for H<sub>2</sub>O<sub>2</sub> Synthesis. *ACS Appl. Mater. Interfaces* **2020**, 12 (20), 22778–22788.  
<https://doi.org/10.1021/acsami.0c00825>.
- Stofela, S. K. F.; Kizilkaya, O.; Diroll, B. T.; Leite, T. R.; **Taheri, M. M.**; Willis, D. E.; Baxter, J. B.; Shelton, W. A.; Sprunger, P. T.; McPeak, K. M. A Noble-Transition Alloy Excels at Hot-Carrier Generation in the Near Infrared. *Adv. Mater.* **2020**, 32 (23), 1–8.  
<https://doi.org/10.1002/adma.201906478>.
- McClary, S.A.; **Taheri, M.M.**; Blach, D.D.; Pradhan, A.A.; Li, S.; Baxter, J.B.; Agrawal, R. Nanosecond Carrier Lifetimes in Solution-Processed Enargite (Cu<sub>3</sub>AsS<sub>4</sub>) Thin Films. 2020, Submitted.
- Elbert, K.C.; **Taheri, M.M.**; Gogotsi, N.; Park, J.; Baxter, J.B.; Murray, C.B. Electron Accepting Naphthalene Bisimide Ligand Architectures for Modulation of  $\pi$ - $\pi$  Stacking in Nanocrystal Hybrid Materials. 2020, Submitted.