Kyle J. Matthews

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Education

Drexel University *Philadelphia, PA*
Bachelor of Science in Materials Science & Engineering Graduated: **June 2020**
Cumulative GPA: **3.45**

Specialized Skills

Technical: Optical and Scanning Electron Microscopy, Electron Backscatter Diffraction, Energy Dispersive X-Ray Spectroscopy, X-Ray Diffraction, Fluorimetry
Laboratory: Mechanical & Electrolytic Polishing, Chemical Etching, Sample Sectioning, Mechanical Testing, Corrosion Testing, Micro-Indentation, Perovskite synthesis (Ligand-Assisted Reprecipitation, Bulk synthesis)
Software: MATLAB, Visual Basic (Excel/Word), TSL OIM Analysis, Origin, Abaqus, ImageJ, Adobe Acrobat, Microsoft Office

Research Experience

Senior Design *September 2019 – June 2020*
Drexel University- Sensor & Functional Materials Group *Philadelphia, PA*

The goal of our senior design group was to stabilize the photoluminescent properties of organometal halide perovskites through the encapsulation of crystals in a polymer matrix. Organometal halide perovskites have potential applications ranging from LEDs, light downconverters, solar concentrators, and materials for bioimaging. Different polymers were studied, and polyvinylidene difluoride (PVDF) was chosen for its flexibility and transparency in thin films, its hydrophobicity, and its piezoelectric phases. Successful composites of $MAPbBr_3$/$MAPbI_3$ and PVDF were created using drop casting, spin coating, and doctor blading methods of film formation. The stability of films with varying ratios of polymer to perovskite was studied in water, and the composites showed significant stability increases.
Advisor: Dr. Wei-Heng Shih

Independent Research *January 2020 – April 2020*
Drexel University- Sensor & Functional Materials Group *Philadelphia, PA*

Investigated Polydimethylsiloxane (PDMS) as a stabilizing encapsulant for methyl-ammonium lead bromide ($MAPbBr_3$) perovskite nanocrystals. The perovskites were synthesized using ligand-assisted reprecipitation (LARP). Composites were formed by mixing the perovskites and PDMS before curing. After curing, the composites were tested for stability in water and showed extended stability with virtually no decrease in photoluminescence
Advisor: Dr. Wei-Heng Shih

NREIP - Materials Researcher *June 2018 - September 2018*
Naval Surface Warfare Center Carderock *Bethesda, MD*

Used optical and electron microscopy techniques on various aluminum samples that were collected from active use or similar conditions recreated in the lab. The goal of these experiments was to gain insight into the precipitation of unwanted phases in different aluminum grades with varying microstructures. This information could be used to develop a trend that could be used to select materials and processes that mitigate sensitization. Additionally, G67 corrosion tests were carried out on the same materials to gain insight on the rate of corrosion associated with these alloys under different levels of sensitization.
Advisor: Dr. William Golumbfskie

Research Co-op *April 2018 – June 2018*

Drexel University - Dynamic Characterization Group *Philadelphia, PA*

Worked with a group of researchers from the materials science & engineering departments at Drexel & Carnegie Mellon University as well as the mechanical engineering department at Drexel University. This group plastically deformed copper samples, analyzed their microstructure using advanced characterization techniques, such as High-Resolution Electron Backscatter Diffraction (HR-EBSD), and applied computational dictionary indexing to compare to Hough-transformation based indexing. These datasets were run through a MATLAB program to quantify the dislocation content in the materials. The goal of these experiments was to apply computation and modeling to better understand the formation of dislocations in FCC materials.
Advisor: Dr. Mitra Taheri

STAR Scholar *June 2017 – September 2017*

Drexel University - Dynamic Characterization Group *Philadelphia, PA*

Studied the application of soft magnetic composites (SMCs) in additive manufacturing. I worked with GKN Hoeganaes to focus initially on binder-jet additive manufacturing with a coated ferrite powder known as AncorLam. Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray Spectroscopy (EDS) were performed on the AncorLam powder to confirm particle size and distribution of coating. Parts in various shapes for mechanical and magnetic tests were printed and sintered successfully. The goal of this project was to study the feasibility of using the complex geometries capable in additive manufacturing in conjunction with the low core losses present in SMCs for use in electric motor components.
Advisor: Dr. Mitra Taheri

Undergraduate Research *Sep 2016-Jun 2017/Sep 2017-Apr 2018*

Drexel University - Dynamic Characterization Group *Philadelphia, PA*

I joined the Dynamic Characterization Group and began to assist in lab work and attend group meetings. After being briefed on standard lab practices and safety measures, I was instructed in metallographic preparation using manual & automated equipment, which included sample sectioning, polishing, and optical microscopy. I prepared a variety of materials using these skills, including steel, aluminum, and additive manufactured samples. This experience gave me the necessary lab skills to move seamlessly into larger projects when possible, and the knowledge to understand the questions and rationale of research projects.
Advisor: Dr. Mitra Taheri

Publications

- Foley, D. L., Pate, C., **Matthews, K.,** Zhao, X., Savino, N., Degraef, M., . . . Taheri, M. L. (2019). Application of Forward Modelling and Dictionary Indexing to EBSD Orientation Data as a Means of Quantifying Dislocation Substructure Formation in FCC Metals. *Microscopy and Microanalysis, 25*(S2), 208-209. doi:10.1017/s1431927619001776
- Benack, N. C., Wang, T., **Matthews, K.,** & Taheri, M. L. (2018). Additive Manufacturing Methods for Soft Magnetic Composites (SMCs). *Microscopy and Microanalysis, 24*(S1), 1066-1067. doi:10.1017/s1431927618005810