# Materials Science & Engineering Graduate Seminar

Wednesday, February 12, 2020, 4:10-5:00PM, FASB 295

## Danielle Beatty

### Multi-Principal Element Alloy design, fabrication, and characterization for use in extreme environments

Abstract: Multi-principle element alloys (MPEAs) are an emerging class of materials consisting of 3+ multiple principal elements. Due to entropic effects, MPEAs can be highly stable at elevated temperature with hardness, tensile strength, and corrosion resistance potentially suitable for structural applications in extreme environments. Due to the infinite compositional range of MPEAs, a multifaceted experimental and computational approach can greatly benefit discovery efforts. In this work, over 30 different alloys are synthesized using powder metallurgy, focusing on compositions containing the main constituent elements Fe, Cr, Ni, Mn, Al, Si, and Cu. The effects of alloying are investigated and reported in detail: microstructural and mechanical property characterization is conducted using X-ray diffraction, electron microscopy, hardness testing, and thermal analyses. Results are compiled into a materials database to increase data availability, and to aid machine learning frameworks in identifying and differentiating compositions of interest during alloy development.

Bio: Danielle Beatty is currently finishing the combined BS/MS degree in Materials Science and Engineering here at the U. She plans to continue with research through a PhD program (also in MSE) starting in Fall 2020, where her main interests are sustainability, cradle to cradle materials development, energy technologies, and the importance of connecting materials science and engineering across disciplines, especially with environmental science and ecology. Outside of work, Danielle enjoys running, kickboxing, cooking, and getting outside.

## Curtis Session

### Molecularly imprinted hydrogels for ophthalmic drug delivery

Abstract: Molecularly imprinted hydrogels are a fast-growing field of polymer science in which hydrogel is formed with specialized pockets to capture and release a specific molecule. A major area of research for this technology is in drug controlled-release drug delivery. Because vision-correcting contact lenses are composed of basic hydrogel materials, it is simple to modify them with molecular imprinting techniques to hold drug that is traditionally administered via eye drops. Utilizing hydrogen bonding principles, pockets within the contact lens material are formed around the ophthalmic drug and hold it for later diffusion in solution or on the eye's surface. Recipe optimization was performed to obtain the best ratio of monomers, solvents, and initiators. Kinetics testing was performed to understand the copolymerization for future recipe modifications, and preliminary drug diffusion rates through UV-Vis were obtained.

Bio: Curtis graduated with a B.S. in Chemistry from the University of Utah in 2015 and worked at IM Flash for 3 years before returning to the U for a graduate degree. He is currently working on his M.S. in Materials Science and Engineering, performing research under Dr. Jeff Bates on Hydrogels with plans to graduate in Spring 2020.