Title: Multi-modal Microstructural Characterization of Commercially Pure Titanium Deposited by Wire Arc Additive Manufacturing

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Abstract:
Wire arc additive manufacturing (WAAM) is a large-scale process to efficiently 3D print metals using a wire feedstock. This process allows for larger parts to be produced and repaired in a reasonable amount of time. However, microstructural defects can occur as a result of feedstock, process speeds, and temperature. Inclusions and recrystallization are items of concern. WAAM allows for layering to be done on a substrate and on existing layers. Analysis of the heat affected zones (HAZ) and melt pools are also vital. Understanding these features allows for optimization of process parameters. Commercially pure titanium (CP-Ti), is under consideration as a candidate for WAAM. Common impurities in CP-Ti include oxygen and iron; these impurities could have a profound influence on the microstructure of the build and must be considered carefully. While WAAM lends itself to larger build sizes, information at the micro- and nano-scales are critical. By using optical microscopy (OM), the build can be observed to further pinpoint regions of interest that should be further analyzed under scanning electron microscopy (SEM) and transmission electron microscopy (TEM).

Presenter's Bio:
Kyrus Tsai is a third-year PhD candidate in the University of Connecticut's Materials Science and Engineering program. Kyrus joined the Aindow Microscopy Lab in the fall of 2020. The first year of his research was focused on cold-sprayed refractory metals. The second year of his research was focused on analysis of materials produced via WAAM. He received both his BS in Chemical Engineering and BS in Chemistry from Calvin University in 2020.