

**Title:** Microstructural Analysis of Tantalum Feedstock Powders and Cold-Sprayed Deposits

**Authors:**

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**Abstract:**

Refractory metals, such as tantalum, are under consideration as the next generation of cold sprayed materials due to their favorable thermal and mechanical properties. Studies of the microstructure in the powder particles and in the resulting deposits will provide an insight into the deformation mechanisms and the evolution of the grain structure. Feedstock Ta powders with two different morphologies (angular and spheroidized) and mesh sizes (325 and 500) were used to produce the deposits. The microstructures in the samples were studied using a combination of scanning electron microscopy (SEM) and x-ray diffraction (XRD) techniques. Backscattered electron SEM imaging from the powders and deposits revealed dramatic differences between the grain sizes and morphologies in the powders and the corresponding deposits. In all cases, the grain structures in the deposits were refined extensively, and mean values of the grain size were extracted from measurements of XRD line broadening using the Scherrer equation. The results indicate that there is dynamic recrystallization occurring during cold spray of these Ta powders resulting in a fine equiaxed grain structure. The final deposit grain size also depends on the powder size and morphology and the significance of these effects will be discussed.

**Presenter's Bio:**

Kyrus Tsai is a second-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 tantalum but has since transitioned to the analysis of materials produced via WAAM. He received both his BS in Chemical Engineering and BS in Chemistry from Calvin University in 2020.