COLD SPRAY DEPOSITION OF METALLIC-UHTC COMPOSITES

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Cold spray deposition is a process by which powder particulates are transported by supersonic velocities in a He gas stream towards a substrate. Upon impact, these powders ‘cold weld’ to form a consolidated, deposited layer. This process requires the powder particles to accommodate significant plasticity to achieve reasonable deposition efficiency; consequently, ceramics are not commonly fabricated through this route. In this work, a composite of Ta and TaC was achieved through cold spray deposition. By agglomerating Ta and TaC powders, the Ta metal was able to accommodate the necessary deformation to yield a composite cold spray deposition. The resulting composite structure has been characterized through electron backscattered diffraction to assess the grain size, grain boundary misorientation, and texture of the deposit as well as the TaC dispersion. Furthermore, electron diffraction methods have been applied to assess the deformation development that has occurred in the Ta phase. Through this characterization, the fundamental mechanisms that enable UHTCs to be deposited by cold spray deposition are being understood. This work is supported by ARO-W911NF-21-2-0084.