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Properties of Cold Sprayed and Controlled Atmospheric Plasma Sprayed High Entropy Alloy (CoCrFeMnNi) Coatings

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High entropy alloys such as the Cantor Alloy (CoCrFeMnNi) have gained significant interest over the last decade for their unique microstructure and mechanical/chemical properties. Advanced processing of High entropy alloys has led to new engineering problems, specifically in application of coatings that retain phase and reduce oxidation. In order to reduce these deleterious effects during processing, this study explored two thermal spray techniques with the CoCrFeMnNi alloy: Controlled Atmosphere Plasma Spray and Cold Spray. Both techniques resulted in no measurable oxygen uptake in the coating or phase precipitation. Selective depletion of Manganese was observed in the plasma spray process at the interface of splats and is thought to be due to the high vapor pressure of Mn compared to the other elements in the alloy. Cold Spray of the material resulted in no alterations in composition or phase from the feedstock but did result in a doubling of Vickers hardness due to work hardening which is inherent to the cold spray process. Implications of applying advanced coating processes with high entropy alloys is also briefly discussed.

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