

The comparative study of the microstructural and corrosion behaviour of laser-deposited high entropy alloys

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**Abstract:**

Corrosion is a conservational occurrence that has a large economic impact on most metals and its alloys because it destroys and deteriorates most materials by an electrochemical process through the reaction of these materials with the environment. High Entropy Alloys in aerospace applications react with the environment in applications such as jet engines, especially at elevated temperatures. Thus, the capacity of high entropy alloys to resist corrosion must be investigated to expand the application of this advanced material in the aerospace industry. In this comparative study, AlCoCrFeNiCu and AlCoCrFeNiTi High Entropy Alloy samples were fabricated by Laser Additive Manufacturing, particularly direct energy deposition and the corrosion behaviour of both alloys were examined and compared. The influence of the laser processing parameters on the microstructure and corrosion responses of the high entropy alloys in 3.5 wt% NaCl solution was also investigated. The microstructural morphologies were examined using an X-ray diffraction system (XRD) and Scanning electron microscope (SEM) equipped with Energy Dispersion Spectroscopy (EDS). The results showed that the Scan speed had the most influence on the microstructure and corrosion behaviour of the alloys. There was a strong relationship between the phase structure of the alloys and their susceptibility to localized corrosion. Therefore, it has been proposed in this study that the phase distribution within the alloys also influences the corrosion behaviour of laser deposited high entropy alloys.