Suitability of Laser Engineered Net Shaping Technology for Inconel 625 Based Parts Repair Process

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In this paper, the Inconel 625 laser clads characterized by microstructural homogeneity due to the application of the Laser Engineered Net Shaping (LENS, Optomec, Albuquerque, NM, USA) technology were studied in detail. The optimized LENS process parameters (laser power of 550 W, powder flow rate of 19.9 g/min, and heating of the substrate to 300 °C) enabled to deposit defect-free laser cladding. Additionally, the laser clad was applied in at least three layers on the repairing place. The deposited laser clads were characterized by slightly higher mechanical properties in comparison to the Inconel 625 substrate material. Microscopic observations and X-ray Tomography (XRT, Nikon Corporation, Tokyo, Japan) confirmed, that the substrate and cladding interface zone exhibited a defect-free structure. Mechanical properties and flexural strength of the laser cladding were examined using microhardness and three-point bending tests. It was concluded, that the LENS technology could be successfully applied for the repair since a similar strain distribution was found after Digital Image Correlation measurements during three-point bending tests [1].

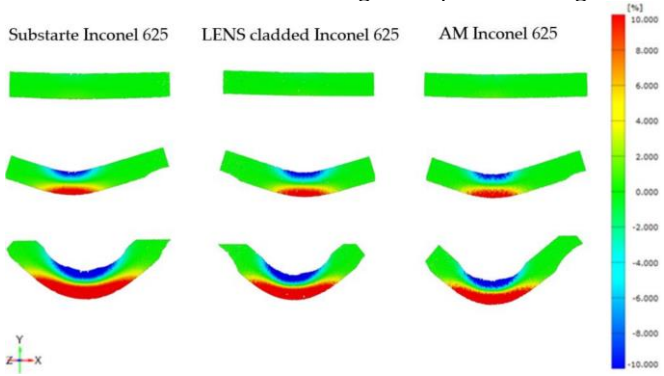

Fig. 1: DIC strain distribution maps of the Inconel 625 in the as-received state, with additional clad and additively manufactured.

References

[1] *Barwinska, I.; Kopec, M.; Łazińska, M.; Brodecki, A.; Durejko, T.; Kowalewski, Z.L. Suitability of Laser Engineered Net Shaping Technology for Inconel 625 Based Parts Repair Process. Materials 2021, 14, 7302. https://doi.org/10.3390/ma14237302*