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Study the Laser Cladding of Ultra High Strength AerMet-100 Alloy powder on AISI4340 steel for Repair & Refurbishment

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ABSTRACT

AISI4340 is a commonly used material in aerospace, automotive, ballistic components, energy and general engineering sectors for various power transmission components such as pinion housing, gears, shafts, connecting rods, propeller shafts, & landing gears of aerospace vehicles etc. Such components can be damaged during operation due to wear at the contact areas and refurbishment of such components using laser cladding can save the replacement cost. In addition, refurbishment technology can be beneficial in countering environmental concerns.

In this work, feasibility of using AerMet-100 alloy powder for refurbishment of AISI4340 steel was explored using laser cladding process. A 6kW diode laser with 6+2 axes robot was used for the experimentation where laser clads were generated by melting and depositing the powder that was fed through a powder-feeding nozzle. AerMet-100 clads were found to have good compatibility with the substrate and defect free clads were generated. In order to homogenize the microstructure at heat-

affected zone, a post-clad heat treatment (PCHT) at 470°C for 1hr was carried out. The as-cladded microstructure shows lath martensite with retain austenite, whereas post clad heat-treated sample shows slightly reduced retained austenite. Micro-hardness evaluation revealed increased in clad hardness after PCHT due to formation of fine carbides. Micro-tensile test of post heat-treated clad showed max Tensile stress of 1752MPa compared to substrate 1240MPa. It can be concluded that AerMet-100 material can be a potential candidate for repair and refurbishment of AISI4340 steel.

Keywords: AerMet-100; AISI4340; As cladded; PCHT; Microstructure; Micro-Tensile and Vickers Hardness.