

Experimental and numerical analyses of geometrical and microstructural features of Tribaloy T-800 composite coating deposited via laser cladding-assisted with pre-heat (LCAP) process

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Abstract:

Laser clad (LC) tribaloy (T-800) coating has been used for surface modification of engineering components in high wear and elevated temperature service environments. However, the cracking phenomenon often observed in LC T-800 coating is undesirable hence the adoption of laser cladding assisted with pre-heat (LCAP) to mitigate it. LCAP is hereby investigated for the remanufacturing of EN8 equipment. The effects of LCAP parameters (pre-heat temperature, linear laser energy density (LLED) and WC-86 content) on the aspect ratio (AR), contact angle (β), secondary dendrite arm spacing (SDAS) and dilution ratio (DR) were studied to optimize an economic T-800/WC-86 composite coating with good mechanical properties via response surface modelling (RSM) with central composite design (CCD). Outcomes from this study revealed that the pre-heat temperature was the most influential on the responses obtained. The predicted models were corroborated with the actual experimental results, thus, validating the results obtained. The optimum composite coating was achieved at pre-heat temperature of 400.00 °C, LLED of 50 kJ/m and 20% WC-86 content and characterized with AR = 11.84, β = 19.12°, SDAS = 1.66 μ m and DR = 0.15.