Experimental & Thermodynamic Modeling Analysis for Functionally Graded Material

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ABSTRACT

Since Laser metal deposition (LMD) has obvious flexibility in fabricating, coupled with various powder input, LMD provides an opportunity to produce the advanced graded material which can join the dissimilar alloys in industries. In this research, the LMD is applied to explore a new fabricating process to produce the continuously functionally graded material (FGM) joining the Ti64 and SS316. A transition composition route was introduced: Ti64-V-Cr-Fe-SS316. A thin wall FGM sample was fabricated by laser metal deposition following the transition composition route. Vickers hardness test on the sample showed that there is no significant formation of intermetallic phases in the LMD process. Composition distribution analysis was performed by point scan EDS. The EDS results can reflect the FGM transition composition route design. XRD tests results demonstrated that the generation of intermetallic phases was effectively avoided following the composition route. After that, thermodynamic calculator Factsage was used to simulate the phases formed in the LMD process. By comparing with the XRD data, the calculated stable phases were reasonable.

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