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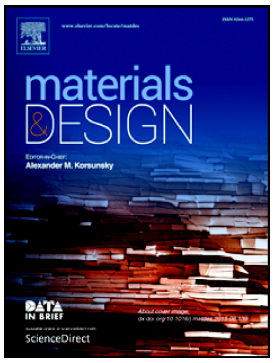

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Online assessment of TiC decomposition in laser cladding of metal matrix composite coating

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Abstract

Decomposition of ceramic particles in metal matrix composite coatings developed by laser cladding process is one of the major problems that deteriorate the mechanical properties of coating. Further, a large number of process parameters involved in laser cladding makes the process optimization difficult. Therefore, a study was undertaken to assess the condition of TiC particles in the molten pool by monitoring the thermal history using an IR pyrometer. It was observed that with the increase of molten pool lifetime, a reaction layer is created between TiC particles and metal matrix which improves their bonding. However, with further increase in the molten pool lifetime TiC particles were found to decompose completely forming dendritic structure in the metal matrix through heterogeneous nucleation and subsequent crystallization during the solidification process. This results in a change of the solidification shelf slope which can be used as an effective signature to assess the TiC particle condition in molten pool online without performing any destructive test. The modified structure of metal matrix exhibited brittle nature which increased the wear rate due to fracture and spalling of coating during the wear test.

Keywords: *Laser cladding, IR pyrometer, online monitoring, molten pool thermal history, decomposition.*

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